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AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XV AUGUST 23, 1926 NUMBER 14

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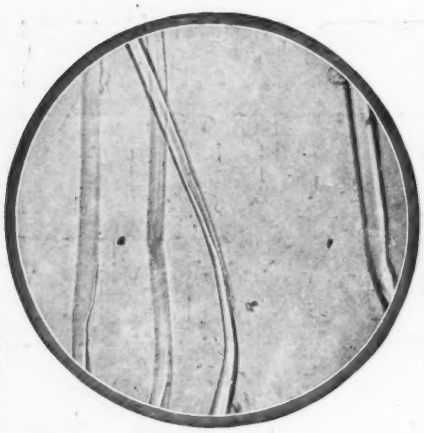
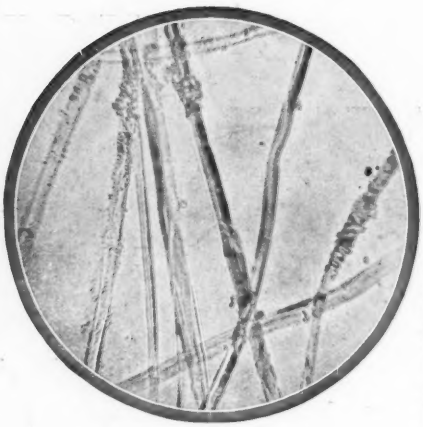


The photomicrograph at the left, shows how clean the fibres come out when properly degummed in properly conditioned water. Clean fibres like these will make quality products.



The photomicrograph at the right, shows a faulty spot in silk that has been degummed in water containing a small amount of impurity. Note the deposits that cling to the fibres. These deposits caused by hidden impurities in the water, are the cause of rejections which have heretofore been difficult to trace.

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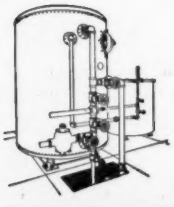

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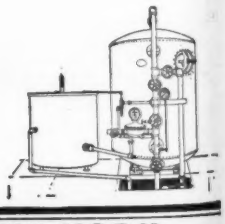

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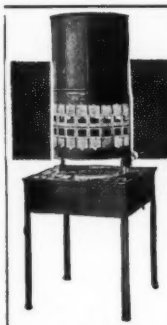

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VOLUME XV NEW YORK, AUGUST 23, 1926 No. 14

Protein Compounds—I

The Formation of Chemical Compounds of the Proteins, Including Wool, with Acids and Bases—The Factors Governing These Reactions and the Hydrolysis of These Compounds

By CHAS. E. MULLIN, M.Sc., F.A.I.C.

Consulting Chemist, Camden, N. J.

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IN the foregoing papers we have seen how the amino acids unite with either acids or bases to form definite chemical compounds. We have studied the amino acid structure of the proteins, particularly wool, and the chemical combination of these proteins with either acids or bases has been mentioned. This was done with a full realization that these compounds are not universally accepted by all textile, or in fact all other chemists. However, it should be pointed out that these protein compounds are much more universally accepted in most branches of science and industry than they are in the textile and dyeing industry at the present time.

While a further discussion of the chemical reactions of the amino acids and proteins, including the keratin of wool, and the formation of definite chemical compounds of these protein materials with either acids or bases, under suitable conditions, may appear to be out of its logical order at this time, the proof of this point, and its acceptance or rejection by the reader, is such a large factor in the hypotheses of the following papers that it seems desirable to cover this point at the present time.

All chemists agree on the chemical combination of the amino acids with either acids or bases, under the required conditions, to form definite chemical compounds. Why, then, is it not reasonable to assume that any free amino or carboxyl groups in the protein molecule may react with either acids or bases, respectively, to form definite chemical compounds, under suitable conditions, in just the same way as they do in the almost identically similar but smaller amino acid molecule?

Colloid Chemistry

The principal obstacle to the acceptance of this chemical theory in regards to the reactions of the proteins, on the part of most textile chemists, is the present deeply rooted belief in the theories of the so-called colloid chemistry. Many textile chemists look to the theories of colloid chemistry for all of the explanations of dyeing and many other textile problems. Yet most of these same chemists do not have a really clear and definite understanding in their own minds as to all of the details and mathematics of the colloid chemical theories involved in the very processes they attempt to explain by the simple statement that dyeing is a matter of colloidal chemistry. To get down to facts, is this whole colloidal theory of dyeing so clear in your mind that you can write an explanation of the chemistry, physics, and mathematics involved?

The older theories of classical chemistry are as a whole far more clear to most chemists and dyers, and even some physicists, than some of the newer theories of colloid chemistry. It is true that until the discovery of the hydrogen ion concentration factor in connection with protein compounds, it was impossible to give a satisfactory and wholly complete explanation of the dyeing of wool (and silk) on a chemical basis, but this factor has given us a new research tool to apply to these reactions, with the result that we are now able to prove the existence of definite chemical compounds of the proteins.

In fact, in view of the data obtained by the study of hydrogen ion concentration in this connection, such a brilliant investigator as Loeb, "Proteins and the Theory of Colloidal Behavior," page 22, goes so far as to say that "It is, therefore, obvious that the so-called colloid chemistry of proteins is a system of errors based on inadequate and antiquated methods of experimentation"; and that "acids, alkalies, and neutral salts combine with proteins by the same chemical forces of primary valence by which they combine with crystalloids, and that, moreover, the

influence of the different ions upon the physical properties of proteins can be predicted from the general combining ratios of these ions."

Among biological chemists and many others working on the chemistry of the proteins at the present time, there does not appear to be any doubt whatsoever as to the formation and existence of definite chemical compounds of the proteins with both acids and bases, but probably not with both at the same time; although this latter point is somewhat in debate, and may account for the decided action of certain salts upon the proteins, as, for instance, sodium chloride solution upon silk.

While the proof of the existence of these compounds is not proof that the chemical theory of dyeing is the only one involved in dyeing all fibers with all varieties of dyestuffs, it certainly does bring the chemical theory of dyeing into the very immediate foreground and at the same time to some extent obviate many of the arguments in favor of the purely physical or colloidal theories of dyeing. It also brings the mordanting of wool and silk with metallic salts into the field of strictly chemical theories, which are now largely accepted in the leather industry. Further, it goes a very long way in explaining the injury to animal fibers in all chemical processes of manufacture.

In all of these chemical theories regarding the proteins the hydrogen ion factor plays the leading role as it is only in this way that we are able to determine the true activity of the solution, which in this case, as in many others, is the principal determining factor. The constantly growing use of this new instrument in all branches of chemical research and control has opened up whole new fields of vision in all industries, especially the textile and related industries. In fact, we were never able definitely to prove the existence of true chemical compounds of the proteins until we had this new tool. This was undoubtedly the reason for the rapid advancement and adoption of the other theories of dyeing, etc.

Bogue's Book

In the following discussion the author is particularly indebted to Dr. Robert Herman Bogue, author of "The Chemistry and Technology of Gelatin and Glue" for a considerable amount of material. Dr. Bogue and the publishers, the McGraw-Hill Book Company, have very kindly granted permission to quote from this most interesting and valuable book, which should certainly have been included with the other books mentioned in the preface to the present series of papers.* The only excuse for this omission is that at the time of writing the earlier papers of this series, the author was unacquainted with this book. Dr. Bogue's work covers many points in connection with the proteins in a much clearer manner than was formerly available in the technical literature. Part I, and especially Chapter No. V, is of particularly interest to textile chemists or others seeking proof of the existence of true chemical compounds of the proteins with acids and bases.

*American Dyestuff Reporter 15, 245-6 (1926).

The Amphoteresis of the Proteins

The term "amphoteric colloid" is very frequently used in describing the proteins, but is most certainly not limited to the proteins alone. Before discussing the formation of protein compounds further, it may be well to dwell upon the meaning of the term "amphoteric" and the amphoteresis of the proteins and other compounds. The very meaning of this term, when used in connection with the proteins, may be taken as an admission that compounds of the proteins with both acids and bases are possible, as G. Bredig, *Z. Electrochem. 6,* 33 (1899), who was the first, or among the first to use this term, distinctly applied it to substances possessing the power of combination with ions of either an acid or a base.

W. B. Hardy, *Proc. Royal Soc. 66,* 110 (1900), in connection with his conception of the isoelectric point of proteins, gave a very nice experiment demonstrating the amphoteric character of the proteins. He shows that if egg white is diluted with eight or nine times its volume of distilled water, dialyzed against distilled water until free of salts, and then boiled, it becomes opalescent, but the protein is not precipitated; it remains in colloidal solution. If a little acid is now added to this solution and an electric current passed through the solution, the protein collects as a tough, white mass at the cathode. If the solution is made very faintly alkaline instead of acid, the protein collects at the anode. Thus in acid solution it is electro-positive and in alkaline solution, electro-negative.

Among the large number of more or less common amphoteric compounds, that is, compounds exhibiting the property of exhibiting either basic or acidic properties, depending upon the conditions to which they are all more familiar with the composition of this inorganic compound than that of the complex proteins and Bogue ("Chemistry and Technology of Gelatin and Glue," page 220) gives an excellent discussion of amphoteresis in connection with it.

Aluminum hydroxide is nearly insoluble in water but readily dissolves in acids to form an aluminum salt, and in bases to form a metal aluminate. The ionization equilibrium is given by Bogue as:

$$Al^{+++} + 3(OH)^{-} \leftrightarrows Al(OH)_3 \leftrightarrows 3H^{+} + (AlO_3)\equiv;$$ and $$3H^{+} + (AlO_3)\equiv \leftrightarrows H^{+} + (AlO_2)^{-} + H_2O.$$

The action of the acid or base upon amphoteric substances of this type is very simply explained by the *law of mass action,* and *solubility product* of Guldberg and Waage.

According to the law of mass action.

$$\frac{(A1^{+++}) \times (OH^{-})^{3}}{(A1(OH)_{3})} = Kb, \text{ and}$$

$$\frac{(H^{+})^{3} \times (A10_{3}^{\equiv})}{(A1(OH)_{3})} = Ka,$$

where Kb is the ionization constant for the basic ionization of the aluminum hydroxide, and Ka the ionization constant for the acid ionization of the same. The brackets signify concentrations in all cases. So long as the aluminum hydroxide is present in solid form, the amount of this substance in solution will be constant, depending upon its solubility at that temperature, and, therefore, the product of the concentration of the $A1^{+++}$ ions and the concentration of the $(OH^{-})^{3}$ ions will be a constant. But if now an acid is added the concentration of the hydroxyl ions must be greatly reduced, for, by the same law,

$$(H^{+}) \times (OH^{-}) = Kw,$$

the ionization constant for water, and any increase in hydrogen ions must therefore result in a decrease in the hydroxyl ions in order that their product may remain constant. But as the hydroxyl ions decrease, more aluminum ions must be produced in order that $(A1^{+++}) \times (OH-)^{3}$ remain constant. This can take place only through the dissociation of more aluminum hydroxide and upon continuing the process, the latter must eventually be brought entirely into solution.

The addition of a base would, in an entirely similar way, depress the hydrogen ions, and result in an increase in the aluminate ions which would likewise result in solution of the aluminum hydroxide.

This same type of amphoteresis is found in the organic acids, as shown, for example, in the ability of acetic acid to substitute either hydrogen or the hydroxyl of its carboxyl group:

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O; \text{ and}$$
$$3CH_3COOH + PCl_3 \rightarrow 3CH_3COCl + P(OH)_3.$$

Bogue goes on to explain that a different condition is encountered in certain organic compounds, wherein the basic and acidic properties emanate from distinctly different groups within the molecule, such as in the case of the amino acids or proteins. The amino group is distinctly basic and will combine readily with acids, while the carboxyl group is the common organic acid group, and combines with bases. Thus, in aminoacetic acid or glycerine.

$$CH_2{<}\begin{matrix}NH_2\\COOH\end{matrix} + HCl \rightarrow CH_2{<}\begin{matrix}NH_3Cl\\COOH\end{matrix}; \text{ and}$$

$$CH_2{<}\begin{matrix}NH\\COOH\end{matrix} + NaOH \rightarrow CH_2{<}\begin{matrix}NH\\COONa\end{matrix} + H_2O.$$

At the present time we may safely assume that the proteins are composed of many amino acids, and if it could be shown that each of these constituent amino acids carried its amino and carboxyl groups in an uncombined state, as in the simple acid illustrated, then no further explanation would be required to account for the amphoteric behavior of the proteins. Bentz and Farrell, *J. Soc. Chem. Ind. 16*, 405-6 (1897), and many others [Van Slyke and Birchard, *J. Biol. Chem. 16*, 539 (1913); Trotman*, *J. Soc. Dyers and Colourists 40*, 77-9 (1924)] have pointed out, however, that only a very small portion of the total nitrogen of protein is present in the free condition. See Table X. But after a complete hydrolysis in which process the acids are liberated from their combinations, the nitrogen present in free amino groups ranges from 60 to 80 per cent of the total nitrogen.

TABLE X

Percentage of Total Nitrogen of Proteins Present as Free Amino Groups

	Per Cent
Haemoglobin	6.0
Casein	5.5
Haemocyanin	4.3
Gelatin	3.1
Edestin	1.8
Gliaden	1.0
Zein	0.0
Wool (Bentz and Farrel)	1.0 to 1.2

Van Slyke and Birchard, *J. Biol. Chem. 16*, 529 (1913).

Bogue points out that as the acids unite with the proteins in considerably larger proportions than that indicated by the figures in Table X, it is obvious that still other groups besides the free amino radicals are capable of reacting with acids. In fact, Van Slyke and Birchard have shown that the free amino nitrogen in proteins corresponds exactly to one-half of the nitrogen represented by the lysine alone that is present. Reference to Fig. I, AMERICAN DYESTUFF REPORTER *15*, 446 (1926), shows that lysine contains an *alpha* and an *omega* amino group and as the time required for the latter (*omega*) to interact with nitrous acid (thirty minutes) is the same as that required by the protein, but is much longer than is taken by the *alpha* group (three minutes), it seems highly probable that the free amino nitrogen of an unaltered protein is attributable only to the *omega* amino nitrogen of lysine, especially as zein, which contains no lysine, yields no amino nitrogen with nitrous acid. Any hydrolysis will, however, result in the formation of amino acids, and then all *alpha* groups, as well as some others, will become free and respond to the nitrous acid reaction.

Inasmuch as the amino groups are very readily attacked by nitrous acid when in the form of $—NH_2$, but are not affected while in the protein molecule, it follows that they

*See Table VII, American Dyestuff Reporter 15, 500 (1926).

must be in some kind of combination in the latter. While the exact form of this combination has not been finally settled, the peptide linkage, wherein there is a condensation between the amino groups of one acid and the carboxyl group of another, as shown below, is usually accepted as the most probable form of combination; however, several others are also possible.

$$NH_2CH_2CO:\underset{\cdots\cdots}{\overset{\cdots\cdots}{OH}} + \underset{\cdots\cdots}{\overset{\cdots\cdots}{H}}:HNCH_2COOH \rightarrow$$

$$NH_2CH_2COHNCH_2COOH + H_2O.$$

The peptides and polypeptides are therefore essentially amino acids, and are capable of reacting with acids or bases through their terminal amino and carboxyl groups respectively, but as previously stated such reaction is not confined to these groups alone. Bogue points out that this has been demonstrated in a number of ways. Vernon, *J. Physiol. 31*, 346 (1904), showed that the capacity of a hydrolyzed protein to neutralize bases was only slightly greater than that of the unaltered protein. Blasel and Matula, *Biochem. Z. 58*, 417 (1917), and Pauli and Herschfeld, *Biochem, Z. 62*, 245 (1914), prepared deaminized gelatin by allowing nitrous acid to react with the protein, and found that acids combined with the product to nearly the same degree as with the untreated gelatin. The fact that deaminized wool is dyed with acid dyestuffs to approximately the same shade as the normal fiber has been repeatedly used as a strong argument against the chemical theory of dyeing. However, as there can be no terminal amino groups in the deaminized product, it is obvious that the acid reacts with some internal groups. And as the internal —COHN— groups are transformed upon hydrolyses to —COOH and $—NH_2$ groups with no marked increase in basic or acidic combining capacity, it seems probable, according to Bogue and logical reasoning, that the —COHN— groups also are capable of neutralization, and responsible for the reactivity of the proteins with ionizable compounds.

Bogue states that many other investigations make it imperative that this conclusion be accepted. For instance. Osborne, *J. Amer. Chem. Soc. 24*, 39 (1902), has shown that edestin combines with acids in such proportions that a very large percentage of its neutralizing power must be derived from other than free $—NH_2$ groups; and Osborne and Leavenworth, *J. Biol. Chem. 28*, 109 (1916), found that edestin combines with cupric hydroxide in exact proportion to the amount of —COHN— groups which are present in the unaltered edestin molecule. Obviously the hydrogen ion concentration of the solution very largely controls the extent of this combination or neutralization.

Robertson, "The Physical Chemistry of the Proteins," New York (1918), page 195, found that potassium hydroxide combined with casein in increasing amounts as the ratio of the alkali to the casein in the system increased. By interpolating from his data he believes that at least five different compounds of the base with the casein are capable of existence, and with the addition of each equivalent of potassium hydroxide a new set of —COHN— groups open up in ionization. Thus, in the first reaction, the casein molecule is broken into two ions by the introduction of one equivalent of the base. A second portion breaks these into four ions, and so on until at the maximum combining capacity sixteen equivalents of the base have been added, and sixteen —COHN— groups in the casein have been opened up. The same process is ascribed to the ionization of all proteins.

However, L. J. Harris, *Chem. and Ind. 44*, 1016 (1925), states that in the examination of synthetic polypeptides he was unable to find any evidence for the supposed acid-base binding power of the peptide linkage, and that acid and base binding power was restricted to the known number of free carboxyl or amino groups present.

Robertson, *loc. cit.*, pages 24 to 31, points out that both a keto and an enol form of the —COHN— group may and probably do exist in the protein molecule under different conditions, as for example, the keto form:

$$H_2N.CH_2.CO—NH.CH_2.COOH, \text{ or } R—\overset{\overset{H}{|}}{N}—\overset{\overset{O}{||}}{C}—R;$$

and the enol form

$$H_2N.CH_2.C(OH)=N.CH_2.COOH, \text{ or } R—N=\overset{\overset{OH}{|}}{C}—R.$$

Pogue states that the latter form is the more probable since it allows combinations with either acids or bases while the former appears only capable of combining with acids.

According to Robertson, the enol form may react with acids or bases as follows:

$$R_1—N=\overset{\overset{OH}{|}}{C}—R_2 + NaOH \rightarrow R_1—N=\overset{\overset{ONa}{|}}{C}—R_2,$$

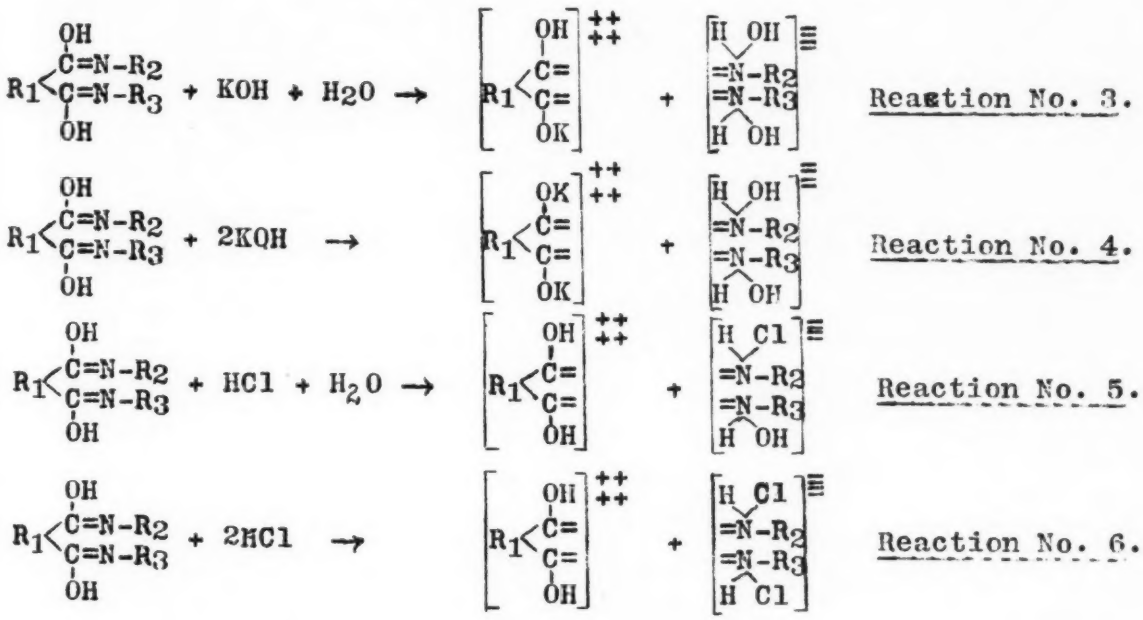
$$\text{which ionizes to } (R_1—\overset{\overset{H\,OH}{\vee}}{N}=)^{=} + (=\overset{\overset{ONa}{|}}{C}—R_2)^{++},$$

Reaction No. 1; and $R_1—N=\overset{\overset{OH}{|}}{C}—R_2 + HCl \rightarrow$

$$R_1—\overset{\overset{H\,Cl}{\vee}}{N} = \overset{\overset{OH}{|}}{C}—R_2, \text{ which ionizes to}$$

$$(R_1—\overset{\overset{H\,Cl}{\vee}}{N}=)^{=} + (=\overset{\overset{OH}{|}}{C}—R_2)^{++}, \textit{Reaction No. 2.}$$

The diamino acids can further increase the number of possible combinations as follows:



Reaction No. 3.

Reaction No. 4.

Reaction No. 5.

Reaction No. 6.

Of the above, all but No. 3 have possibly been found under various conditions. It will be noticed in the above that Robertson regards the ionic separation as occurring between two parts of the protein molecule rather than between the protein on one hand and the inorganic cation on the other. Robertson's experiments, *loc. cit.*, pages 167, and those by Kohlrausch and Holborn, "Das Leitvermogen der Electrolyte," Leipzig (1898), upon the conductivity of protein salt solutions certainly indicate that Robertson's theory regarding the hydrolysis of the protein salt at the peptide linkage is correct. Pogue points out that this view is necessary if we consider that combination takes place not only at the terminal groups but also with these groups when in internal —COHN— groups.

In a recapitulation of his very masterly discussion of protein compounds, Bogue, *loc. cit.*, page 236, says, "Evidence has been presented which indicates that:

a. Proteins are amphoteric compounds capable of combining with either acids or bases to form protein salts. The salts thus formed yield, in water, true or colloidal solutions which contain ions, together with nonionized hydrated colloid aggregates.

b. Ionization of these salts takes place, not primarily between the protein and the inorganic ion by a reaction with terminal —NH or —COOH groups, but between nearly equal portions of the protein molecule, by a break in the internal —COHN— groups.

c. Protein salts are relatively stable and not easily, or but slowly, dissociated hydrolytically.

d. The extent of salt formation is determined by the relative proportions of acid or base present, and but little by the degree of dilution of the system.

f. An equivalent of a mono-acid base yields twice the number of equivalents of a protein salt as an equivalent of a diacid base.

g. Successive additions of acid or base to a protein open up additional —COHN— groups situated at or near the center of the molecules or ions acted upon.

h. The ionization of the proteins takes place essentially at the points of union of the diamino and of the dicarboxylic acid groups.

Loeb also appears to support Robertson's theory of the hydrolysis of the protein salts, for he says that in order to simplify the chemical reactions of the proteins we may disregard the enormous protein molecule and go on the assumption that the protein consists only of a number of amino groups, each of which, on the acid side of the iso-electric point, is capable of adding the hydrogen ion of an acid.

In our own textile field, the results of the work of Trotman and Wyche, *J. Soc. Chem. Ind.* 43, T293-5 (1924), on the fixation of chlorine by wool may also be taken as evidence of the chemical activity of the —COHN— group in proteins. They point out that if the keratin molecule is built up in the manner of a polypeptide, the number of free amino groups capable of reacting with chlorine must be comparatively small. If wool contains as much as one per cent of free amino nitrogen, this would be insufficient to account for the chlorine absorbed during chlorination, hence they say that it is unlikely that the amino groups play a very important part in the reactions concerned. This is also indicated by the fact that the total chlorine absorbed by ordinary and deaminated wool is practically the same, namely, from 24 to 35 per cent, and in both cases the rate of absorption is almost identical. When either normal or deaminated wool are treated with chlorine, at

first there is a very rapid disappearance of chlorine, followed by a slow and gradual absorption. This they say appears to indicate that both absorption and chemical action takes place, at first simultaneously, and after absorption has ceased, chemical action only.

Yet upon the removal of absorbed chlorine from the chlorine treated wool samples, by washing them several times with an acidified solution of hydrogen peroxide, which does not remove chlorine combined as chloramines, they found the amount of chlorine remaining in normal and deaminated wool fabrics to be nearly the same, as shown in Table XI. After the hydrogen peroxide treatment the fabric still liberated iodine from potassium iodide in the presence of an acid. This action is only destroyed gradually by boiling in water. This most certainly indicates that the chlorine is in combination with the —COHN— groups, while the results given in Table XI may indicate that the hydrogen ion concentration of the solution is the determining factor as to the amount of chlorine combining with the wool.

TABLE XI

Combined Chlorine in Wool Fabric

	Percentage of Chlorine in Dry Fabric	
	Sample No. 1	Sample No. 2.
Original fabric	6.6	5.3
Deaminated fabric	6.4	5.7

(This is the sixth article in the series of papers by Charles E. Mullin relating to "Wool." Protein Compounds—II, will appear in an early issue and in this paper the iso-electric point of the proteins and the effect of the hydrogen ion concentration upon the formation of protein compounds will be discussed.)

The "Blinding" of Viscose Dyed With Insoluble Azo Colors

Combinations Causing Blindness of the Fiber — Difference in Color Between Blinded and Non-Blinded Skeins — Combinations with Naphthols

By F. M. ROWE, D.Sc., F.I.C.

THE application of azo compounds in dyeing artificial silks by processes of diazotization and development has a definite limitation in that certain combinations may "bind" or render the fiber non-lustrous. Thus, cellulose acetate dyed with ionamines or other diazotizable bases is liable to be blinded by subsequent diazotization and development on the fiber as a result of the crystallization of the coloring matter. This indicates that dyeing is a solution process in this case, for the increase in the molecular complexity of the coloring matter resulting from diazotization and development produces a supersaturated solution in the fiber. This then crystallizes almost completely, leaving a practically colorless fiber throughout which large aggregates of coloring matter are disseminated and mask the luster.

The continual additions to the commercial series of diazotizable bases and so-called naphthols in recent years has also led to the application of insoluble azo colors of this type to artificial silks, such as viscose, to produce a range of fast shades. C. M. Whittaker has drawn attention to a definite limitation of these coloring matters in the case of viscose, however, for heavy shades are liable to blind the fiber, while a combination which will not blind the fiber when soaped at 60 deg. Cent. may do so if finished off in a boiling soap bath ("Dyeing with Coal Tar Dyestuffs" 2nd edition, p. 219). He has now very kindly supplied me with a number of blinded and non-blinded skeins of viscose which form the basis of the present note.

A combination which shows the phenomenon of blinding in a particularly marked degree on viscose is 1 per cent Naphthol AS-RL (*p*-anisidide of β-hydroxynaphthoic acid) and 5 per cent Fast Orange G Salt (stabilized diazotized *m*-chloroaniline). When this is finished with soap and soda at 60 deg. Cent., a handsome orange is produced, but on boiling, blinding occurs, the skein appears dead and non-lustrous, and the color is bluish-red with an orange cast.

Another combination in which blinding produces a very noticeable effect is 1.5 per cent Naphthol AS-BO (α-naphthalide of β-hydroxynaphthoic acid) and 7.5 per cent Fast Orange G Salt. This gives a fine and rather deeper orange shade than the preceding combination when finished at 60 deg. Cent., but boiling produces a dull red effect, reminiscent of sealing-wax. The characteristic luster of the viscose has disappeared in the latter case, and the skein approximates more nearly in appearance to natural silk, suggesting that in selected cases blinding might perhaps be of commercial value for certain purposes.

An interesting feature of insoluble azo coloring matters is the difference in color between the crystals, a finely divided powder and a solution of any given compound of this type in a solvent, such as toluene. The difference in color between the above blinded and non-blinded skeins is very similar to the difference in color between the crystals and a toluene solution of the coloring matters concerned. This suggested that the non-blinded skein consisted of a true solution of the coloring matter in viscose, whereas in the blinded skein the coloring matter had coagulated or crystallized in aggregates which were dissemi-

nated throughout the fiber. Microscopic examination proved this to be the case, for the non-blinded fibers were evenly stained, and any individual particles of solid coloring matter, caused by local excess of naphthol, were on or near the surface, whereas the blinded fibers consisted of a suspension of aggregates of coloring matter evenly distributed throughout the virtually colorless fiber. This is seen clearly in the case of the combination of Naphthol AS-RL and Fast Orange G Salt in Figs. 1, 2 and 3.

The blinded fibers appear to be non-lustrous, because the solid particles of coloring matter mask the luster, but actually the viscose has lost none of its luster, as this is unaffected by prolonged boiling with soap and soda, or even by kier boiling. The soap and soda used in finishing

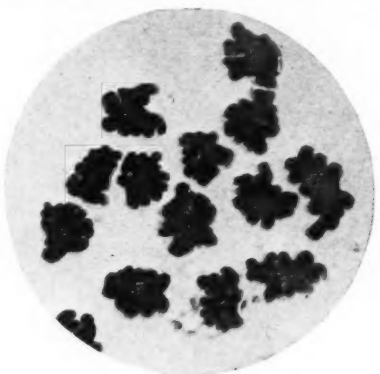


FIG. 1
Cross-Sections of Lustrous Fibers Finished at 60 Deg. Cent. x330

the dyed viscose appear to have no connection with the coagulation of the coloring matter associated with blinding, for the same effect can be produced with boiling water alone. Consequently, the blinding of viscose dyed with insoluble azo coloring matters appear to be solely a temperature effect, and is connected, no doubt, with the degree of solubility of the individual coloring matter in viscose. Blinding on viscose appears to be a common property of insoluble azo coloring matters, and Whittaker

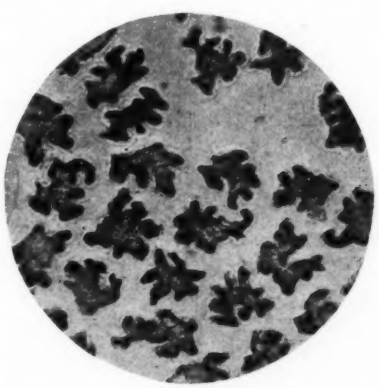


FIG. 2
Cross-Sections of Blinded Fibers Finished Boiling x330

(*loc. cit.*) has noted that Fast Black LB base (2-ethoxybenzene-azo-α-naphthylamine), Fast Black B Salt, Fast Red KB base (hydrochloride of 4-chloro-2-aminotoluene) and Fast Garnet G and GB bases (*o*-aminoazotoluene)

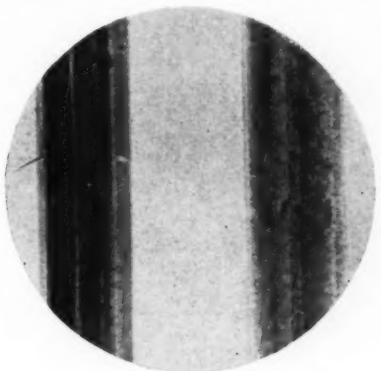


FIG. 3
Lustrous and Blinded Fibers x550

are the least likely to cause blinding. Actually, however, as will be seen later, the tendency to cause blinding appears to be a function of neither the diazotized base nor the naphthol, but of the azo coloring matter itself.

Naphthol AS-SW (β-naphthalide of β-hydroxynaphthoic acid) in conjunction with diazotized Fast Red KB base is a combination less susceptible to blinding, and this suggested that some of the newer combinations, which on cotton are even faster to kier boiling, might give rise to blinding on viscose to an even less degree. This proved

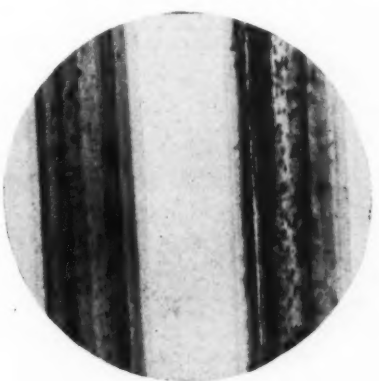


FIG. 4
Fiber Soaped at 60 Deg. Cent. and Fiber Soaped at 90 Deg. Cent. x550

to be the case, for in the following examples, in spite of the fact that finishing with soap and soda at 90 deg. Cent. produced a slight change in shade as compared with that at 60 deg. Cent., there was no apparent decrease in the luster of the dyed viscose, although some coagulation of the coloring matter could be detected under the microscope in every case, even when finished at the lower temperature:

Golden orange with 1 per cent Naphthol AS-D (*o*-tolu-

idide of β-hydroxynaphthoic acid) and 1 per cent Fast Scarlet TR base (hydrochloride of 6-chloro-2-aminotoluene).

Cerise with 1 per cent Naphthol AS-D and 1 per cent

FIG. 5
Cross-Sections of Fibers Soaped at 60 Deg. Cent. x330

Fast Red TR base (hydrochloride of 5-chloro-2-aminotoluene).

Rose with 1 per cent Naphthol AS-D and 1 per cent Fast Red KB base.

Orange red with 1 per cent Naphthol AS-TR (5-chloro-*o*-toluidide of β-hydroxynaphthoic acid) and 1 per cent Fast Scarlet TR base.

Scarlet with 1 per cent Naphthol AS-TR and 1 per cent Fast Red KB base.

Red with 1 per cent Naphthol AS-TR and 1 per cent Fast Red RT base.

Least difference could be detected with the naked eye between the viscose finished at 60 deg. Cent. and 90 deg.

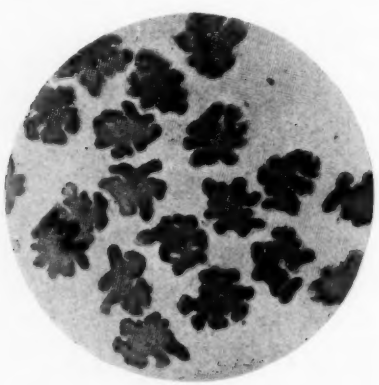


FIG. 6
Cross-Sections of Fibers Soaped at 90 Deg. Cent. x330

Cent. in the case of the combination of Naphthol AS-TR and Fast Red TR base, illustrated in Figs. 4, 5 and 6. In the case of the cross-sections, aggregates of solid coloring matter are seen to be disseminated throughout the fiber to much the same extent when finished at 60 deg. Cent. as when finished at 90 deg. Cent. The improvement shown by the above examples, however, suggests that color makers might well turn their attention to the manufacture of insoluble azo combinations specifically to avoid blinding on viscose. The combinations with Naphthol AS-TR were the best among those examined, but that blinding is not a function of the naphthol is shown by the fact that Naaphthol AS-TR in conjunction with Fast Orange G Salt is as susceptible to blinding as the combination Naphthol AS-RL and Fast Orange G Salt.

In conclusion my thanks are due to F. P. Slater and H. A. Hancock, of the experimental department of the Fine Cotton Spinners' and Doublers' Association, Ltd., for the preparation of the photomicrographs which illustrate this note.—Journal of the Society of Dyers and Colourists.

WOOL STUDY DESCRIBED AT BRITISH CHEMISTS' MEETING

A paper entitled "Hygroscopic Relations of Colloidal Fibers" was presented in the Mathematical and Physical Science Section at the recent gathering in Oxford of the British Association of Chemists. According to a report of the meeting, the lecture on colloidal fibers was the work of three British research workers and might have been called a study of wool and water absorption.

It was stated that wool has the greatest capacity for absorbing moisture of all textile fibers, and that its elastic properties are extraordinary. Even though stretched almost to the breaking point, if kept wet it will return to its original length.

In treating of the fading of dyed fabrics it was mentioned that colors are more likely to fade in damp than in dry climates, even if the power of the sun were the same.

BRITISH DYE TRADE LARGER LAST YEAR

Great Britain's exports of dyes in 1925 were 10 per cent greater in volume than in 1924, according to the Department of Commerce. British exports of alizarine dyes, however, fell off 10 per cent. The increases were in synthetic Indigo and other dyes.

The Island of Taiwan, Formosa, produced 3,067,379 pounds of natural Indigo paste in 1925, a small increase over 1924. The production is mostly consumed by the large Formosan-Chinese population for Indigo-dyed cloth.

Canada, in the fiscal year ending March 31, 1926, imported 955,283 pounds of refined naphthalene in flakes and balls, a 50 per cent increase over the previous year. Germany tripled its share of this trade by exporting 607,700 pounds to Canadian ports.

The 53,336 pounds of refined naphthalene imported by Canada from the United States was a substantial gain for the year.

Scouring Efficiency and Its Relation to Dyeing

Dyeing in the Grease—Recent Researches—Scouring Essentials—Temperature and Other Details

IN the dyeing of men's wear material it is of the greatest importance that the goods should be well scoured before any dyeing takes place. Scouring to-day has taken on quite a new aspect in some places, and is becoming a very much more scientific process than has been the case in the past. Much more is known of the operation.

Simple as it may seem, we cannot say that as yet we thoroughly understand all that happens when pieces and other textile materials are being cleansed. We can, of course, set about washing goods and get results which will be fully satisfactory for the dyer whatever the shade he is dyeing—that is, the dyer will be satisfied that the goods are quite clean. Some dyers, however, would be satisfied even if a little soap were left in the so-called "scoured" materials, but in other cases such goods would be the cause of very serious unevenness if all soap were not removed after scouring. Where such goods, whether in the piece or in the yarn state, are for men's wear, they would perhaps afterward be dyed with chrome colors, which have first to be treated with bichromate, and there would be chrome soaps formed which would have a very detrimental effect when dyed and cause streakiness and general unevenness in the finished piece.

Dyeing in the "Grease"

If acid dyes are being employed for the dyeing after scouring, the question of soap removal from the piece after scouring may be still an important one for the dyer; but it is not so likely to prove such a bugbear to him, as the soap would be merely converted into a fatty acid which would not probably offer any resistance to dyeing. After all, there is a large amount of dyeing carried out to-day in this country "in the grease," and while the resultant cloth may not be clean—indeed, it may be very dirty and the color rub badly—yet the effect of free fat being in the material is not to give unevenness of result if later suitable dyes are chosen. The goods may indeed "feel" or "handle" better by not eliminating the fat present in the cloth, although such non-scouring of cloths for men's wear is not to be recommended and is really almost solely limited to the cheapest of wool piece goods.

In the preliminary processing of such goods through the finishing works there is an attempt partially to cleanse the cloths of free fatty matter by giving them an "earth" on the washers, using, of course, fuller's earth for the purpose. In this way there is a removal of the loosest parts of the oils and fats and a perhaps cleaner resulting material, but the finished product does not approach to the properly scoured pieces. The slippery handle of the merely "earthed" pieces can also be obtained in other ways and with a more lasting satisfaction.

Again, it is not a good thing for a works where properly scoured goods are being treated to scour in an inferior manner any of the material passing through, or the fats or oils present in the non-scoured or only partially scoured materials will be given up to the cloths and the press papers through which other pieces which have been properly cleansed will pass, and there is a consequent liability to stain the latter.

Even where the colors which are being dyed are dark shades, it is equally important that the material will be well scoured. Where soap is left in the goods and chrome colors are being employed, which is a very common procedure for men's wear materials, there is always a "resist" against dyeing produced by the combination between the soap and the "chrome," and in the case of dark shades the non-dyeing of the stained places makes these show up all the more.

Recent Researches

For the scouring operation itself perhaps there is not a great deal of technical knowledge required in order to prepare wool goods for the dyer, but good scourers are by no means to be had *ad lib*. The scourers of to-day may not be as a whole classed as scientific in their work, although they may produce the results which are required for the trade, and recent researches have undoubtedly a great deal to teach us as regards improvement in result of scoured pieces.

The costs of scouring may be lowered perhaps without harmfully affecting the results on the cloths by adhering to the principles taught by modern scouring, but perhaps more obvious still, some of the faults with which we are to-day troubled might be obviated by attending to causes which recent researches have shown us are productive of faults. Mention might be made here, as an example, of the lessons taught by the results of the researches into the migration of alkali in wool pieces. This might be a very serious source of faulty dyeing, and the means of overcoming it are not very difficult to attend to.

Scouring Essentials

There does seem, however, a tendency to doubt the possibility of introducing science with good effect into such an apparently simple operation as scouring. After all, what is mainly wanted for a good scour are some good washers, a soft water, some good neutral soap and soda, and perhaps some ammonia, and at times some of the patent scouring agents recommended in the trade for removal of certain stains and types of oils which may

be present in wool goods. Some scourers will doubt the efficacy of the latter compounds, and would, therefore, leave these out.

The main thing, then, is to know how to handle these substances in the washers while the pieces are running round. A scourer cannot, apparently, get far wrong with these things, but he does, nevertheless—at any rate, he is generally blamed for not using them properly!

The main things to note, however, are to see that these substances are added carefully, or stains may result; and the temperature should not be much above hand heat. The liquor should not be too weak or too strong, and should just nicely give a lather, without being too thick. The pieces should be what is known as "crossed" at the back so that the folds of the goods are not being run continually in the same position, because of the liability to make a permanent crease in the goods by so doing, thus "crimping" or "marking" them.

The time varies according to the amount of cleansing required and the finish of the piece in question, but what is essential is the effective removal of the oils, fats and dirts first, and then the satisfactory removal of the soaps used—that is, a good wash-off is essential. This, broadly speaking, is the method adopted for getting pieces clean. No times are stated nor quantities, but these have both been more or less reduced to scientific terms according to research results of recent years. As yet it may not appear to matter a great deal if these researches are not carefully noted. As a matter of fact, it does, and some day it will be very much more apparent and the subject of more concern for many reasons.—Textile Argus.

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XXV

Two-Sided Treatment—Construction of the Plant—Its Operation and Advantages—Two-Color Effects on Thin Fabrics—Construction and Features of the Plant

(*Continued from page 531*)

By RAFFAELE SANSONE

FOR superficially spray-topping the cotton fabrics on both sides with solutions of the basic color in a volatile solvent, and recovering as much of this last as possible, a plant constructed on the prinprinciple shown in Fig. 1 would offer special advantage.

Here is to be seen a light iron table (G), the upper portion of which contains a low iron case (K), having on the top a large glass window, through which the operatives can observe at any time how the cloth is being treated; a suitably placed electric lamp, facilitating this observation during dark days or night work.

The interior of case K contains a pair of endless chains (C), supplied with clips, which through an internal mechanism clasp the cotton cloth as it mounts from the wooden beam M and guide roller t, carrying it to the end of the case, from where it is brought later along the bottom to a second opening, where the slips automatically relax their grip, delivering the material in a dry state to wooden beam D. Endless chains are kept under tension by two pairs of end wheels (m and n), the second of which, n, gives them a slow movement forward, while the first, m, works principally the mechanism acting upon the clips, causing these continuously to grip the cloth, and on the clips later to release it.

The upper portion of case K is furnished with a large tube (N), leading to a long copper coil (Q) in the interior of a broad iron cylinder (R). This is fitted slightly above the case itself. Coil Q is joined at the bottom to tube T, which ends in the upper portion of a centrifugal pump (P). This causes a weak stream of air to pass through case K and in coil Q, where the solvent is obliged to enter in gaseous form and is transformed into liquid, being delivered through a tube on pump P to a double series of collection bottles (I and J), kept in a hole in the flooring of the works, and closed hermetically by special covers, one of which is indicated by c.

The cooling action of case R is assisted by the passage of cold water, caused to mount at some speed through tap U to the overflow tube O. A suitably placed thermometer allows, whenever necessary, the control of the temperature of this water.

The wheels driving the endless chains, the wheels working the clips, and the mechanism turning wooden beam D and pump P are all connected together and are worked by a single electric motor of suitable size and strength. A regulator for allowing the passage of the cloth at four different speeds is also supplied.

For conducting the topping operations a special sprayer is placed on both sides of the fabric indicated in each case by L and S; the first sprayer (L) receives the coloring bath from tube E, tap g and trough A, while the second (S) receives this bath through tube F, tap h and trough B. Both troughs A and B have at their upper portion a chain and ring, and can be raised or lowered through cranes V and X, which run on an upper rail (H)

fixed to the ceiling of the works. They are closed by hinged covers having a small drain tap.

Tubes E and F can be fitted below taps g and h by the assistance of a special screw juncture. They are held in a fixed position by light iron supports. Sprayers L and S are enclosed in a small copper case connected with the lower portion of case K, and remain in this way also under the action of pump P. They are composed principally of a long tube, a central slip of which is perforated at regular intervals only on one side. At the ends of the tube are placed two sliding collars to regulate the spraying to the width of the cloth treated, and which can be fixed wherever required by winged screws.

The short end-shafts of wheels m and n, of the guide-rollers t, and of the centrifugal pump all have ball bearings, so that little noise is caused during the working of the plan, and lubrication is removed easier.

To facilitate the evaporation of the volatile solvent employed in this instance, the interior of case K is heated by a hollow plate running between the pair of endless chains C, which receives the heating medium through a tap on the outside, and is drained of all condensed water formed by the assistance of a small steam trap.

The wooden beam (M) supporting the roll of cloth, entered for the spray-topping operations, has its end axles in bearings that keep them continually under the action of brakes, and prevent the danger of slipping, and consequent formation of slack portions between chains C. The brakes also serve to apply a small tension that assists the entrance between the clips of the endless chains.

Operation of the Plant

Operation of the above plant would offer at first certain difficulties owing to its special nature. It could be carried out as follows: The operatives enter the first roll of cotton cloth to be topped in the bearings at one side of the machine, after sewing to the beginning about one-half yard of waste cotton cloth, causing this last to pass between the first clips on the endless chains C. When this has been done, they turn on steam to heat the interior of case K, and cause running water to circulate rapidly through cylinder R, preparing two separate coloring solutions in troughs A and B with benzine, by using basic colors soluble in this solvent. Both troughs are closed, only leaving open the small taps on the covers, and are brought in front of the topping plant, fixing their taps to tubes E and F.

Taps g and h are then opened for a regulated interval, controlled through a needle at the top that registers on a white plate the number of quarts passing through per minute.

After the above the operatives start the plant. The cotton cloth dyed in the substantive colors is thus sprayed

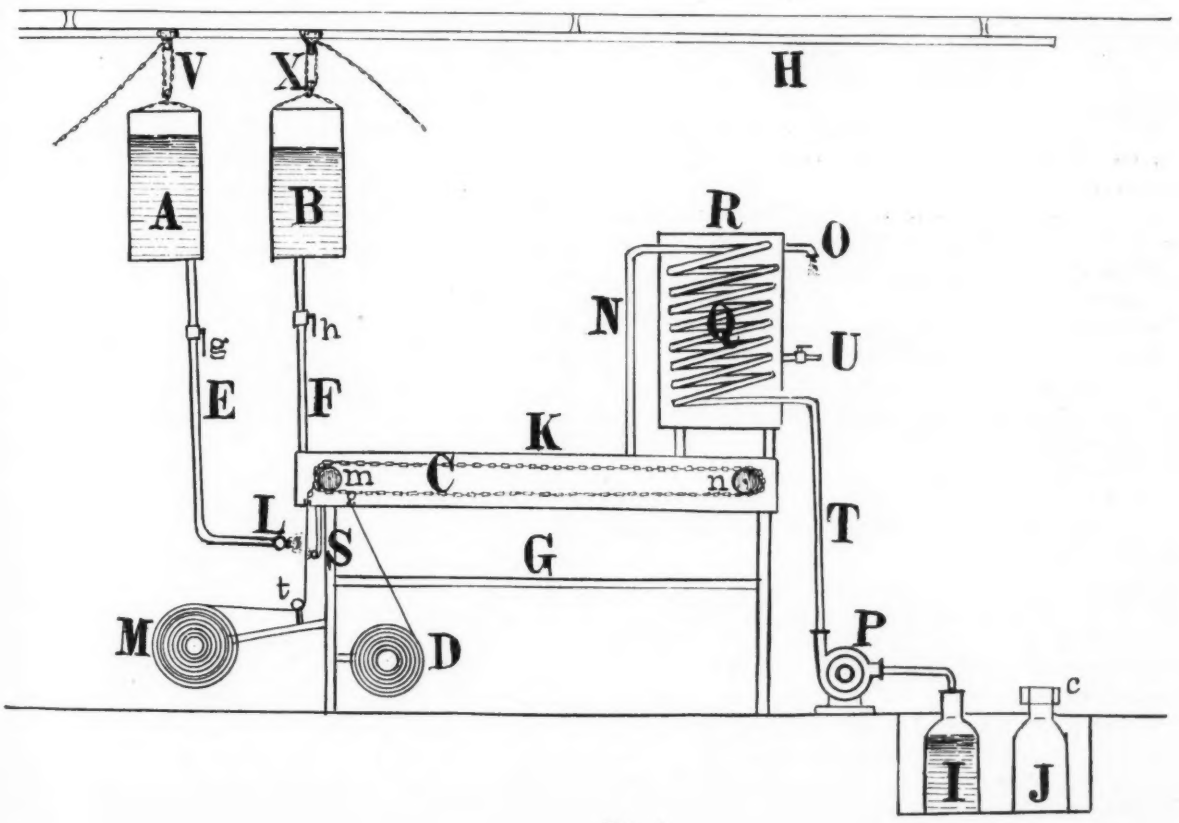


Fig. 1

on both sides by L and S, taking up the required quantity of dyestuff, which is fixed immediately, and mounting between the clips of chains C. These carry it forward at a certain speed, bringing it under the action of the hot air generated above and below the heated plate already indicated, and passing it out in a dry condition to be wound on wooden beam D. The hot air and the action of pump P bring about the elimination of the greater part of the benzine deposited on the cotton cloth goods, which is withdrawn into coil Q. Here the action of the cold water circulating on the outside transforms the benzine into its liquid condition, delivering it quite cold to the double series of collection bottles I and J.

As the cotton goods run through the plant, they are observed carefully by the operatives, who for the purpose occasionally stop the wooden beam D, taking in their hands a portion of the dried fabric, and comparing it with the pattern to be matched. If during a similar examination they find that the material has been too strongly topped, taps g and h are closed somewhat for reducing the number of quarts per minute running through, taking care, however, that this takes place during the passage of a piece end. In this way an irregular topping throughout the pieces is avoided.

Features of the Plant

The plant possesses several marked advantages, some of which can be considered as follows:

1. The portion of the cloth exposed to the spray-topping and drying operations is quite small, and its treatment rapid and economical.

2. A good portion of the benzine originally employed for the solution operations is recovered, and can be utilized several times.

3. The operatives can observe how the cloth is being worked by the endless chains in the interior of case K, and how the clips catch and relax it, being in a position to correct at any time a defect in the treatment.

4. Both sides of the cloth are topped simultaneously in nearly the same spot or position.

5. With careful working no excess of the spraying color should go beyond the borders of the cloth, and the portion of this that splashes either falls back again on the material or is delivered into a small collection trough placed below guide-roller t.

6. The spray-topped fabrics are dried in a straight position; the necessity of a subsequent passage on a stenter or tentering frame for preparing them for shreinering or calendering operations is avoided.

7. If the plant is operated in a well-ventilated compartment of the works, the operatives suffer little from the benzine that makes its way below case K.

8. The production of the plant is large, and the requirements of steam, motive power, labor and benzine quite small, when the necessary precautions are taken from the start.

9. The spray-topping process can be regulated to the distribution of quarts of coloring bath per minute, varying the number of these in accordance with the speed at which the cloth is caused to run through the plant, to the thickness of the cloth treated, to the penetration desired in the material, and to the special nature of the material itself.

10. If the hollow plate placed between the endless chains C is heated with superheated steam or hot air the topping baths can be prepared with methylated spirits, greatly lessening the cost of the treatment and increasing the number of dyestuffs that can be used.

11. One side of the cotton pieces can be topped in a different color from that employed for the reverse, by using two very different basic colors, such as a Methylene Blue and a Safranine, a Methyl Violet and a Methylene Blue, a Rhodamine and a Methylene Blue, etc.

12. Two different topping colors can be formed of a light and dark shade of a same color or of different colors.

13. The spraying can be conducted more intensively on the front than on the reverse of the cloth, or vice versa.

Two-Color Effects on Thin Fabrics

In those cases where it is necessary to spray-top in two colors a thin cotton fabric, avoiding all mixing together —at least on one side of the material—the plant shown in Fig. 2 would offer advantages.

This shows a special form of apparatus, composed principally of a cloth spraying compartment K, and of a final drying apparatus X. The first is constructed of a high square iron case, surmounted by an arched roof supporting two long narrow iron copper-plated troughs (T), each of which contains an inner trough. This last is so made as to leave around its walls a space of a few inches, which is enclosed by non-conductive material joining the upper portion of both troughs, a vacuum produced in the enclosed space.

The two inner troughs are for the solutions containing the basic colors dissolved in methylated spirits, and serving for the topping of the cotton cloth. Through the above arrangement such solutions suffer little through

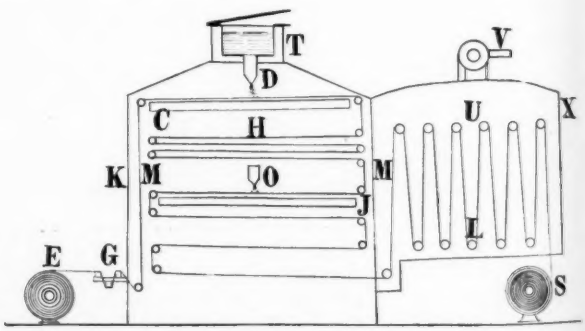


Fig. 2

change of temperature, especially as troughs T are kept closed by heavy copper-plated iron covers.

On the bottom of the two inner troughs are placed two series of tubes (D and O), which through the action of compressed air produce a very fine shower of the dye bath first on one side of two pieces (M) of the cotton material, previously dyed in the direct colors and dried, and then on the reverse. The two pieces of cotton cloth are exposed to the first spraying while passing between two guide-rollers on a hollow copper-plated iron plate C, the upper portion of which has numerous perforations at regulated intervals. The interior of plate C is connected with a tube and tap for compressed air prepared in a small apparatus at the back of the plant.

Below plate C are placed several guide-rollers, on which the cloth is turned with the back exposed above hollow plate J, where it remains under the action of the second spraying tube, indicated by O. Also plate J is hollow and receives compressed air from a tube and tap, which passes upward through numerous perforations on its upper surface.

The lower portion of case K contains a temperature regulator, having a long coil, in which steam is introduced from an outer tap. This case has two large windows at its sides, through which the operatives can observe the cloth as it passes through the apparatus, which can be opened for the cleaning operations. At the bottom, the two pieces of the material (M) are introduced through a very narrow opening, before which is placed a double spreading mechanism (G), composed of three lined copper bars fitted to projecting arms. To this the two pieces of cotton cloth dyed in the direct colors matters are led from wooden beams (E).

Some of the binding rollers in case K are lined in such a manner as to exercise a spreading action, and this prevents the formation of plaits or folds in the interior of case K. At the bottom of case K, and just at the opposite side from where the cloth enters, is an opening of a certain size, through which material M passes in entering into the drying chamber or compartment X. This is of somewhat smaller size than K, and is rounded at the top.

Here a powerful ventilator (V) is fitted, which carries off all solvent fumes and compressed air present in compartments K and X and sends it down a long iron coil, kept in air cooled below 10 deg. Cent., and also prepared in a small apparatus at the back of the plant. The iron coil delivers the mixture of liquefied solvent and compressed air to a collection vessel, the upper portion of which has a long pipe leading to the outer air. The lower part of this vessel has several taps through which the recovered solvent can be withdrawn whenever required.

The interior of compartment or addition X contains many upper and lower guide-rollers U and L, from which the two pieces of cotton cloth are finally led downward and to the outside through a small opening, where they are wound on another pair of wooden beams (S). To avoid the splitting of any portion of the fabrics during their coloring, blowing and drying, some of the binding rollers are fitted in bushes under the action of springs, which also serve to maintain the tension of the goods always the same. The intensity of the tension given in this instance is regulated by side screws. The interior of cases K and X contains several electric lamps, the connections of which are conveniently isolated, to prevent the danger from electric sparks.

Operation of the Plant

To operate the above plant two operatives enter the ends of a pair of waste cotton pieces, so that these pass on all binding rollers in compartments K and X, sewing to the middle of them large samples of the material to be topped, so that these remain on both sides, exposing the faces to receive the topping color.

They regulate the speed of the plant in accordance with the time the material has to remain in contact with the spraying medium, and enter the two solutions to be employed for the coloring operations in the cases in troughs T, regulating the intensity of the sprays on tubes D and O, and starting, at the back of the plant, the preparation of the air under pressure and of the cooled air.

They now warm compartment K to 60 deg. Cent., turn on the compressed air to the tubes D and O and to the hollow plates C and J; also causing the cooling medium to circulate around the coil to liquefy the solvent; and start ventilator V and the plant, until the samples have passed below compartment X. The machine is then momentarily stopped for unsewing rapidly the treated samples and comparing them with standards.

If the effects obtained are satisfactory, the operatives again start the plant, sewing to the end of the waste pieces the beginning of the first pieces of the lot to be topped, which have been rolled on wooden beams and placed in position.

In this way two fabrics pass into the plant, mounting on plate C, where compressed air is blown through them, while they receive the finely pulverized coloring solution, which thus dies on the surface of the first fibers it encounters, before penetrating through one-quarter or one-half of the thickness of the material. While this is taking place the action of the ventilator V withdraws the gaseous solvent and compressed air, forming a partial vacuum in the interior of both compartments K and X.

In the meanwhile the cotton fabrics, after the one-side topping above plate C, remain for some time with their wet portion out of contact with the binding rollers, and this only touches the same when there is no danger of smearing or smudging. They descend further in compartment K and pass under the action of the compressed air of hollow plate J, where the reverse of the cloth is subjected to the action of the second series of sprayers (O). This side is also nearly completely dry before passing in direct contact with the binding rollers in de-

scending to the bottom of compartment K and passing into compartment X. Here the cotton cloth receives the final drying and makes its way downward free from solvent. As soon as the ends of the waste pieces make their way out of compartment X, they are rapidly detached from the beginnings of the topped pieces, which are wound at once on wooden beams to form separate rolls.

The vessel for collecting the volatile solvent is filled slowly and the operatives, after a time, pour it into collection tubs, which are closed hermetically, ready for further employment. The air under pressure is caused after a time to pass again through the small compressing apparatus at the back of the plant, being used in the place of air taken from the outside. In this way any gaseous residues of the volatile solvent are used again, thus guaranteeing a more complete recovery.

As the rolls of cloth on beam E come near the end they are replaced by fresh rolls, sewing rapidly the ends of the pieces; whereas as the wooden beams S are filled at the end of the plant they are rapidly unsewn and replaced with empty beams.

Advantages of the Plant

The above plant, if properly operated, offers many important advantages, some of which can be indicated as follows:

1. Two pieces of cotton cloth, which have been dyed in the substantive dyestuffs in the ordinary way, can be topped at different speeds, or at an equal speed, with color sprays of equal or different intensity, producing the same or different effects.

2. The plant can be employed for topping both lots of pieces in only one color, in two different shades of this, or in two different colors on each side of the material.

3. The plant can be used to top a different color on one side from that produced on the reverse of each lot of pieces.

4. By varying the blowing action of hollow plates C and J, the topping color can be made to penetrate for any desired depth in the material, producing with the same basic color quite different effects.

5. During the topping operations the volatile solvent is continually recovered, and can be employed several times, very little of the same making its way in the processing room, where it can be eliminated by suitable ventilation.

6. The compressed air produced at the back of the plant is also employed several times, keeping this after a time always saturated with the same quantity of unliquefied volatile solvent.

7. The operatives can observe how the cloth is being sprayed in the interior of compartment K, noting at once if something unusual is taking place.

8. The action of the spraying tubes can be suspended at once by the simple moving of a hand lever on the outside of compartment K.

9. The topped cloth only comes in direct contact with the binding rollers when it is nearly dry, thus preventing the danger of smudging, or of the unnecessary dirtying of the binding rollers themselves.

10. Owing to the action of heat in the interior of both compartments, the benzine employed for the spraying operations can be substituted with alcohol that has been denaturated with ether or other means that leave no odor in the finished material after finishing.

Possible Future Solvents

So far the dyer has made principal use of solvents that he could obtain in a liquid form on the market, such as benzine, alcohol, gasoline, etc., only considering in what way he could obtain such products as cheap as possible, and not considering their effect on the operatives. There is no doubt, however, that in the future cheap substitutes will be employed that are produced artificially, and among those that may find a wide use are liquefied gases, especially as the drying of these could be conducted without the use of any heat whatever. Among the ideal gases at disposal for the purpose may then be carbon dioxide, which is not inflammable and can be easily liquefied, and may prove a good solvent for some dyes.

(Part XXVI will appear in an early issue)

PROVIDENCE DYEING COMPANY TO EXPAND LINE

The Providence Dyeing, Bleaching & Calendering Company, of Providence, R. I., anticipates an expansion of its production under its recent reorganization, with a board of directors headed by Wilfred Ward as president. Mr. Ward was long in charge of the Bradford Dyeing Association, of Bradford, R. I. He came to America to direct the building of the Bradford plant, which is a branch of the British firm. He is prominent in the dyeing trade in New York City, and in his new capacity as head of the Providence Dyeing Company his past business success is expected to be duplicated.

The expansion policy proposed for the Providence Dyeing, Bleaching & Calendering Company will embrace the introduction of new lines, with the continuation of the older products. The company is one of the oldest and most widely known finishing plants in America, having been founded in 1814. For many years its production was confined to dyed goods, but under the management of the late Mr. Farnsworth, whose first connection, in 1885, was in the capacity of agent, it became a leader in the bleaching and finishing of the better grades of white goods. Since his death six years ago the policies and standards set by him have been adhered to, while the general efficiency of the plant has been materially increased through the installation of a new power plant and electric drives. Dyeing of cotton and rayon goods also has been revived to a considerable extent.

The Dyer's School of Experience

[EDITOR'S NOTE.—*The following narrative is one of a series being published under the general head of "The Dyer's School of Experience." Realizing that the genuine material for such a series is to be found largely among its own readers, The* REPORTER *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* AMERICAN DYESTUFF REPORTER, *90 William Street, New York City.*]

THE BEST PART OF THE JOB

By NOEL D. WHITE
Davenport Hosiery Mills, Chattanooga, Tenn.

AS I was going to a new job some time ago, and as my route took me past New York, I decided to stop a day and visit some dyestuff dealers in this city and pick up what information I could in their laboratories, concerning my new work.

I knew through some correspondence with my new employer that he wanted to have a special dark blue—he called it night blue—in his line of goods, and not having any samples of this blue I merely endeavored to learn in a general way what was best to use in that line for this purpose.

My acquaintances in the New York laboratories were from the pre-war times and now they were mostly new to me. Old firms had changed names, new ones had come into existence. I visited several, made myself known and explained what I wanted to know, and gained a lot of information I was in need of.

In one place I met a bright young man who received me very cordially and after learning what my errand was, proceeded to give me the needed instructions in a comprehensive manner. I had told him the work I was going into was quite new to me—entirely out of my line, but, that as it was cotton and silk I did not anticipate having any trouble, only that I was anxious to make a good impression at the start, well knowing that the first impression one gives to a new employer is usually a lasting one.

Then he wrote down on a piece of paper a formula to be used with variation as needed for the new blue. I noticed he had in it two dyestuffs that the firm he represented did not make.

As this was, and still is, one of the biggest manufacturers of dyestuff in the country, I was greatly surprised and could not help asking him why he was advising me to use dyes made by a competitor.

This is the answer he gave me: "I want you to go to that new job and make a success of it. I could give you a number or dyes to take the place of those two, but none of them are as good for your purpose as those I gave you."

That answer surely made a hit with me. Then and there I made a mental note that if there ever was a chance I would never fail to throw business in his way.

WORKING WITH POOR MIXTURES

When I arrived at my destination and started in my new dyehouse I found that most of the dyes were unknown to me. The dyer who had just left had failed to make good and the manager of the mill was under the impression that in order to dye a new shade they had to send to a dyestuff dealer a sample of the shade to match, and the dealer had to do the matching and then make up a mixture of dyes for that shade and sell them the already mixed dyestuff, same as you go to a paint dealer to buy paints to paint a house.

Accordingly he had sent to a half dozen or more dyestuff dealers and manufacturers a piece of the blue he wanted and was now awaiting for returns.

Nearly all of the dyes I found here were mixtures. As I was given the formulas, I went ahead and started using them cautiously, but nevertheless I got in trouble right away.

None of the formulas mentioned the use of acid. When I dyed a black and did not use any acid, the silk came out gray instead of black and I had to dye it a second time; using acid this time, I got a very presentable black and the day was saved. When I dyed a brown, using acid, the work came out uneven. By the use of phosphate of soda I corrected this brown. Then I went into the office and said I would not use any more mixtures except those I mixed myself.

I sat down and gave them a list of dyestuffs I wanted and did no more coloring until they arrived. I had learned how to dye black and for a few days did nothing else but blacks.

Then the results of the blue samples the manager had sent out began to come in. Each had a different formula, none was a good match to what he wanted but each dealer had sent a 10 lb. can of the mixed dyes, and I might as well say right here that I used the contents of every one of those cans, a little at a time, in my blacks.

When the dyestuff I had ordered came in I went to work with a determination to make good.

There were not many shades just then, and that helped me a lot. I could concentrate on one shade until I had a correct formula and then take another one and do the same.

When I was ready to start on the blue the manager telephoned to a dyestuff dealer who was a very intimate friend of his and told him I did not want to use any mixture of dyes but wanted to make up my own formulas and that gentleman told him to ask me if I had no objections he would send their chemist, who happened to be in town, to help me.

I told him I would be glad to have him. Early next morning I started in my laboratory with a piece of the material and at my first attempt came pretty near hitting the bull's-eye.

The Dye Chemist Assists

To confirm my first trial, with a little correction, I was preparing for a second sample when Mr. Chemist came in. "Already at it?" he asked.

"Yes," I replied; "and I nearly got it. I am going to use the same formula and a trifle more yellow and I believe it will be correct."

He looked at my trial, then at my formula, then he shook his head and said. "No, you got the wrong colors in it." He had seen some of the colors I had used were not his. "Those colors are no good. These are the colors to use. You just watch me."

I started to watch. I procured some pieces for trials. He made up the formulas, dyed samples, one after another until lunch time came; then we went to lunch.

When we returned he started again and made samples until 5 o'clock. I kept on watching. At this time the manager came in. "Got any good blue?" he inquired.

I did not answer. Mr. Chemist did. "We did not get any very good results so far," he said. "But we must wait for the finding of the New York laboratory."

"Why," said the manager in alarm, "can't we dye blue here? What's wrong?"

"Nothing is wrong," said the chemist; "only we have not the right dyestuff."

"I did not know it was so hard to get a shade of blue." I spoke up then. "Sir," I said to the manager, "It is no harder to dye a shade of blue than it is to dye any other shade, when you have the right dyes. This gentleman insists on using only dyes made by the firm he represents. I have here a trial sample I dyed this morning. See how you like it." And I showed my first trial.

He took it and looked at it. Then he said: "Have you dyestuff enough to dye some lots?" I told him I had. "Fine," he said. "This is the best blue I ever saw. Go ahead and dye them all that way. It is just what I want."

My trial had been thrown in a corner and had cooled off during the day and came up better than it looked in the morning. So I had learned to keep the yellow down because it came up on cooling. Next morning I got a lot. I prepared it and went to work dyeing it according to my formula and got it good shape by nine o'clock. I took a sample to the office for approval.

The chemist came in just then and he started an argument with the manager on the advisibility of having the matching of colors done in the dyestuff dealer's laboratory, the chemist insisting that that was the proper place for that work. But this time the manager had seen for himself that, with a dyer, that was not necessary and could be done as well in the dyehouse. I pointed out to him that with a real dyer, trained in the use of dyestuffs there was no use of being tied down to one dealer only; that there were many makers of dyes and every one was endeavoring to turn out as good dyestuff as the trade needed and the dyer could pick out from each one the best for his special purpose..

Ninety Per Cent Sales Value

Of course the chemist had his own good arguments in favor of his reasoning, but I told him that his system was doing no good to the dyers' fraternity. If every mill could take in a young husky without any previous training in the science of dyeing and then let a young textile school graduate sent by the Cosmos Coal Tar Dye, Ltd., teach him how to weigh out a few ounces of a dye mixture for a given shade, the dyer who had spent all his life in the dyehouse would have to go out of business or take a job for less than it was worth.

I know of several instances where this is actually the case. But I also know that where this is the case the mill is making very little progress. Fortunately this manager was quick to realize the importance of having a real dyer in charge of his work. He had already told me that he considered that 90 per cent of the selling quality of his goods came from the dyeing and finishing—which statement had filled me with pride and determination to exert myself to the utmost not to disappoint him.

When we left the office the chemist came with me to the dyehouse. He admitted I had done a good job and asked me permission to copy my formula. He got it and also got samples of the "offending members" in that combination of dyes.

A few days after, the expected results from the New York laboratory came in. There were two, and very good matches they were. But when we compared the cost both of them were too expensive to produce so I kept on dyeing with my first formula..

Every new shade that was wanted was worked out in my laboratory and I really enjoyed doing it. I thought that was the best part of my job, and I was not going to let anybody take it away from me.

CLEANERS AND DYERS WIN STRIKE

The strike of 1,500 cleaners and dyers of Los Angeles was reported settled August 10 by the Conciliation Service of the Department of Labor.

The workers, who went on strike July 19, returned to work when their demands for a 10 per cent wage increase and a 44-hour working week were granted, according to the department's announcement.

BRITISH EXPORTS OF DYES AND DYESTUFFS

Great Britain's exports of dyes during 1925 were 10 per cent greater by volume than in 1924. Despite the increase of the aggregate, exports of alizarine dyes fell off 10 per cent; synthetic Indigo and other dyes registered the increase in foreign sales.

The Reduction Products of Azo Dyes

Part XIX

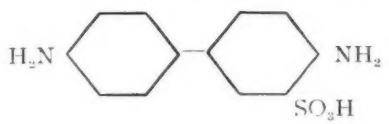
By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 233.—BENZIDINE-3-SULFONIC ACID



$C_{12}H_{12}N_2O_3S$; Mol. Wt. 264.23; (C, 54.5%; H, 4.6%; N, 10.6%; O, 18.2%; S, 12.1%).

Derived from C. I. Nos. 438 and 617.

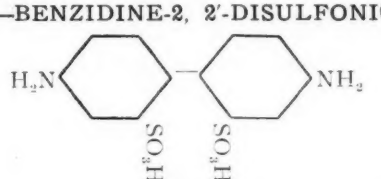
Leaflets, diffic. sol. in hot H_2O, insol. in alc. and ether. The hydrochloride (1HCl) is decomp. by boiling with H_2O with loss of HCl.

Ba salt $(+5H_2O)$, needles or leaflets, mod. easily sol. in boiling H_2O.

The diacetyl deriv. forms a Na salt which cryst. in long needles, diffic. sol. in cold H_2O, readily in hot H_2O.

The acid gives a red-brown color with chlorinated pyridine. On oxidation with warm alk. $K_3Fe(CN)_6$ it yields a red azoxy dye which is readily sol. in hot H_2O.

No. 234.—BENZIDINE-2, 2'-DISULFONIC ACID



$C_{12}H_{12}N_2O_6S_2$; Mol. Wt. 344.29; (C, 41.8%; H, 3.5%; N, 8.0%; O, 27.9%; S, 18.6%).

Derived from C. I. Nos. 441, 442 and 443.

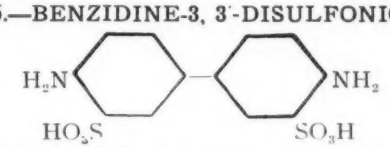
Monoclinic prisms $(+3H_2O)$, which lose water at about 175° and char without melting. Nearly insol. in alc. and ether. Less than .1% sol. in cold H_2O and rather diffic. sol. in hot H_2O.

Na salt $(+3\frac{1}{2}H_2O)$, large yellowish monoclinic prisms; *Ca salt* $(+4H_2O)$, monoclinic prisms, sol. in about 26 parts H_2O at 9°; *Ba salt* $(+4H_2O)$, prisms, sol. in about 104 parts H_2O at 26°.

Amide, needles, mpt. 278°. Its hydrochloride $(+2H_2O)$ cryst. in large prisms, mpt. 205°.

On alk. fusion the acid yields 4, 4'– diaminodiphenyleneoxide, needles, mpt. 150-2°.

No. 235.—BENZIDINE-3, 3'-DISULFONIC ACID



$C_{12}H_{12}N_2O_6S_2$; Mol. Wt. 344.29; (C, 41.8%; H, 3.5%; N, 8.0%; O, 27.9%; S, 18.6%).

Derived from C. I. Nos. 440, 578 and 579.

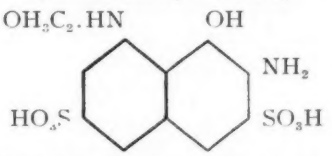
Very small leaflets, nearly insol. in alc. and ether and only very sl. sol. in boiling water. Aqueous sols. are colored green by bromine water.

The Ba salt $(+5H_2O)$ cryst. in thin glittering leaflets. Heated at 150° with insufficient H_2O for solution it yields short thick needles containing only $2H_2O$.

The acid dissolves in strong mineral acids with the formation of unstable acid salts.

It may be converted into 3, 3' dihydroxydiphenyl, needles, mpt. 123.5°, by deamination followed by alkali fusion.

No. 236.—2-AMINO-8-ACETYLAMINO-1-NAPHTHOL-3, 6-DISULFONIC ACID (Amino-Acetyl-H-Acid)

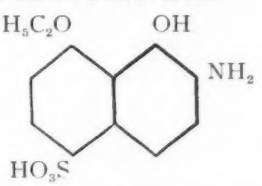


$C_{12}H_{12}N_2O_8S_2$; Mol. Wt. 376.29; (C, 38.3%; H, 3.2%; N, 7.4%; O, 34.0%; S, 17.0%).

Derived from C. I. Nos. 31 and 57.

No data available.

No. 237.—2-AMINO-8-ETHOXY-1-NAPHTHOL-5-SULFONIC ACID

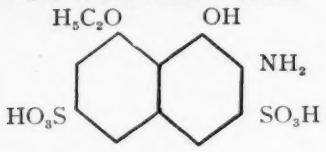


$C_{12}H_{13}NO_5S$; Mol. Wt. 283.23; (C, 50.9%; H, 4.6%; N, 4.9%; O, 28.2%; S, 11.3%).

Derived from C. I. No. 127.

No data available.

No. 238.—2-AMINO-8-ETHOXY-1-NAPHTHOL-3, 6-DISULFONIC ACID

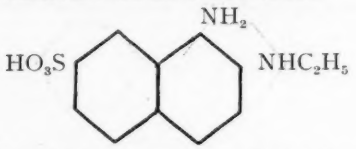


$C_{12}H_{13}NO_8S_2$; Mol. Wt. 363.29; (C, 39.7%; H, 3.6%; N, 3.9%; O, 35.2%; S, 17.7%).

Derived from C. I. No. 127.

No data available.

No. 239.—2-ETHYLAMINO-1-NAPHTHYLAMINE-7-SULFONIC ACID

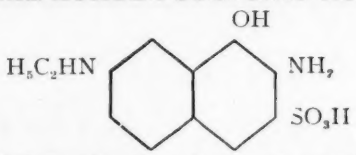


$C_{12}H_{14}N_2O_3S$; Mol. Wt. 266.25; (C, 54.1%; H, 5.3%; N, 10.5%; O, 18.0%; S, 12.0%).

Derived from C. I. Nos. 257, 457, 458 and 497.

No data available.

No. 240.—7-ETHYLAMINO-2-AMINO-1-NAPHTHOL-3-SULFONIC ACID

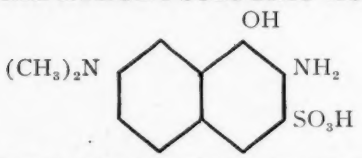


$C_{12}H_{14}N_2O_4S$; Mol. Wt. 282.25; (C, 51.0%; H, 5.0%; N, 9.9%; O, 22.7%; S, 11.4%).

Derived from C. I. Nos. 402 and 403.

No data available.

No. 241.—7-DIMETHYLAMINO-2-AMINO-1-NAPHTHOL-3-SULFONIC ACID

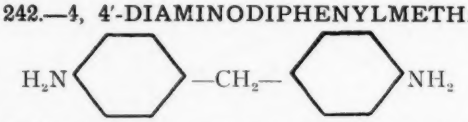


$C_{12}H_{14}N_2O_4S$; Mol. Wt. 282.26; (C, 51.0%; H, 5.0%; N, 9.9%; O, 22.6%; S, 11.3%).

Derived from C. I. Nos. 422, 479 and 628.

No data available.

No. 242.—4, 4'-DIAMINODIPHENYLMETHANE



$C_{13}H_{14}N_2$; Mol. Wt. 198.19; (C, 78.7%; H, 7.1%; N, 14.1%).

Derived from C. I. No. 354.

Silvery glittering leaflets (from H_2O) or dense cryst. (from C_6H_6). Mpt. 92.5° (also reported variously between 86° and 89°). Bpt. 257° at 18 mm. and 398-9° at 768 mm. Readily sol. in alc., ether and C_6H_6. Sp. sol. in H_2O.

The hydrochloride and sulfate cryst. in leaflets, both readily sol. in H_2O, the latter sp. sol. in alc.

Sulfone: Glittering leaflets, mpt. 217°, colored intense blue by nitrous acid.

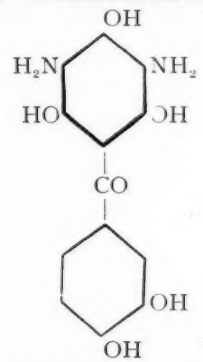
Diacetyl deriv.: glittering small plates, mpt. 228°, nearly insol. in C_6H_6.

Dibenzylidine deriv. (with benzaldehyde), leaflets, mpt. 130°.

On oxidation with alk. $K_3Fe(CN)_6$ it yields a yellow-brown azoxy dye, mpt. 74-5°, which dyes wool and silk red.

With sym. trinitrobenzene it gives an addition product, dark brown flat prisms, mpt. 132.5°.

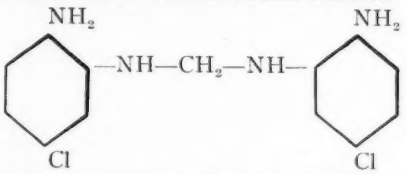
No. 243.—DIAMINOMACLURIN



$C_{13}H_{12}N_2O_6$; Mol. Wt. 292.18; (C, 53.4%; H, 4.1%; N, 9.6%; O, 32.9%).

Derived from C. I. No. 237 together with some diaminomorin. No data are available on either substance.

No. 244.—1, 1'-DIAMINO-4, 4'-DICHLOR-2, 2'-DIPHENYLDIIMINOMETHANE



$C_{13}H_{14}Cl_2N_4$; Mol. Wt. 297.13; (C, 52.5%; H, 4.8%; Cl, 23.9%; N, 18.9%).

Derived from C. I. No. 13.

No data are available on this compound or on the 5,5'-dichlor isomer which is obtained by the reduction of C. I. No. 14.

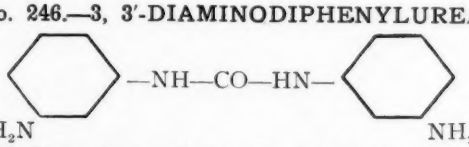
No. 245.—DIAMINO-DIHYDROXYDIPHENYLMETHANE

$C_{13}H_{14}N_2O_2$; Mol. Wt. 230.19; (C, 67.8%; H, 6.1%; N, 12.1%; O, 13.9%).

Derived from C. I. Nos. 614, 615 and 616.

The position of the amino groups is uncertain and no data are available on this compound.

No. 246.—3, 3'-DIAMINODIPHENYLUREA



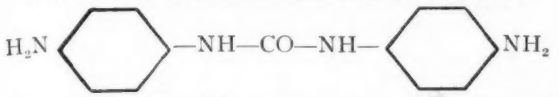
$C_{13}H_{14}N_4O$; Mol. Wt. 242.21; (C, 64.4%; H, 5.8%; N, 23.1%; O, 6.6%).

Derived from C. I. No. 352A.

Needles, mpt. 208-9°, sol. in boiling H_2O.

The hydrochloride (2HCl), white cryst., sol. in H_2O. Forms double salt with $2SnCl_2$ ($+2\frac{1}{2}H_2O$), needles.

No. 247.—4, 4'-DIAMINODIPHENYLUREA



$C_{13}H_{14}N_4O$; Mol. Wt. 242.21; (C, 64.4%; H, 5.8%; N, 23.1%; O, 6.6%).

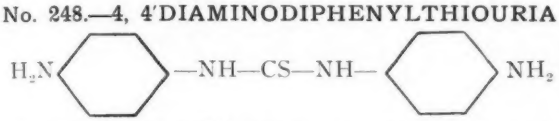
Derived from C. I. Nos. 346, 347 and 348.

Silky needles or leaflets. Sublimes at 310° without melting. Diffic. sol in cold H_2O, readily in hot H_2O. Only mod. sol. in cold alc.

Solutions of the hydrochloride darken in air and are colored violet by $FeCl_3$. Gives a cryst. double salt with $SnCl_2$.

Diacetyl deriv., glittering scales, mpt. 344° (cor.), only very sl. sol. in boiling H_2O. On boiling with dil. HCl it yields the base.

No. 248.—4, 4'DIAMINODIPHENYLTHIOURIA



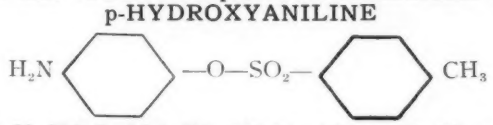
$C_{13}H_{14}N_4S$; Mol. Wt. 258.27; (C, 60.4%; H, 5.5%; N, 21.7%; S, 12.4%).

Derived from C. I. Nos. 350 and 351.

Colorless needles, mpt. 195°. Sl. sol. in hot H_2O and hot alc. Readily sol. in Ac HO and dil. mineral acids. Gives insol. cryst. pptes with picric acid and with sulfuric acid.

Treated with lead nitrate and alkali it yields lead sulfide.

No. 249.—TOLUENE-p-SULFONYLETHER OF p-HYDROXYANILINE

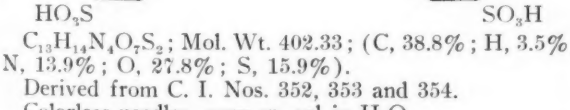


$C_{13}H_{13}NO_3S$; Mol. Wt. 263.24; (C, 59.3%; H, 5.0%; N, 5.3%; O, 18.2%; S, 12.2%).

Derived from C. I. No. 642.

No data are available.

No. 250.—4, 4'-DIAMINODIPHENYLUREA-3, 3'-DISULFONIC ACID



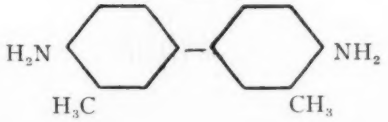
$C_{13}H_{14}N_4O_7S_2$; Mol. Wt. 402.33; (C, 38.8%; H, 3.5%; N, 13.9%; O, 27.8%; S, 15.9%).

Derived from C. I. Nos. 352, 353 and 354.

Colorless needles, very sp. sol in H_2O.

In acid suspension it yields an insol. yellow tetrazo comp. with nitrite.

No. 251.—o-TOLIDINE (Tolidine)



$C_{14}H_{16}N_2$; Mol. Wt. 212.21; (C, 79.2%; H, 7.6%; N, 13.2%).

Derived from C. I. Nos. 446 to 486, 562 to 570, 611, 615 and 616.

Glistening pearly leaflets. Mpt. 127-9°. Sol. in about 7,000 parts cold H_2O and 300 parts hot H_2O. Readily sol. in alc. and ether.

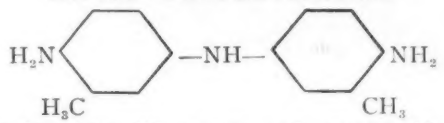
Hydrochloride, mpt. over 340° (decomp.), sol. in 17.34 parts H_2O at 12°; *acid hydrochloride*, lustrous scales, decomp. above 300° without melting, sol. in 112.4 parts H_2O at 12°; *sulfate*, diffic. sol. in H_2O or alc.; *dipicrate*, yellow cryst., decomp. at 215°; *benzenemonosulfonate*, mpt. 310°, *benzene-2, 6- and 2, 7-disulfonates*, both melt above 360° and are very sp. sol.; *1-naphthalenesulfonate*, mpt. 294°, sol. in about 400 parts H_2O at 15°; *2-naphthalenesulfonate*, mpt. over 330°, very sp. sol. The salt with H-acid ($+3H_2O$) melts at 260° (decomp.) and is sol. in about 1,000 parts H_2O at room temp. (gray-violet prisms).

Additive comp. with *sym. trinitrobenzene*, black cryst., mpt. 178°; with *sym. trinitroethylbenzene*, violet-black prisms, mpt. 85°. With 2, 4-dinitrobenzaldehyde it gives an additive comp. in alc. (purple), mpt. 232° and a condens. prod. in Ac HO (yellow-red), mpt. 282° (decomp.).

Diformyl deriv., microscopic needles, mpt. 254°; *monoacetyl deriv.*, white plates ($+1H_2O$), mpt. 103°; *nitroso acetyl deriv.*, brown cryst., mpt. 154-5°; *diacetyl deriv.*, glittering needles, mpt. 306° (also given as 314°); *tetraacetyl deriv.*, glittering needles (alc.), mpt. 211°; *benzoyl deriv.*, mpt. 198-200°; *dibenzoyl deriv.*, needles, mpt. 265°.

Diazotized and coupled with: *β-naphthol*, dark needles with green reflex (toluene), mpt. 297°, sol. in H_2SO_4 with a blue color, blue-violet pptte. on dil.; *Naphthol AS*, dark violet minute cryst., mpt. over 320° C., sol. in H_2SO_4 with a blue color, blue-violet pptte. on dil.

No. 252.—o-DITOLYLAMINE



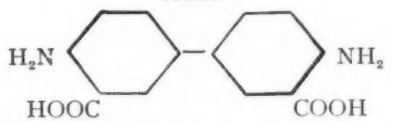
$C_{14}H_{17}N_3$; Mol. Wt. 227.23; (C, 74.0%; H, 7.5%; N, 18.5%).

Derived from C. I. No. 345.

Liquid. Bpt. 312° (decomp.) at 727.5 mm.

If KNO_3 is added to a sol. in H_2SO_4 it turns yellow, then green and finally red-brown. With KNO_2 the color obtained is purple-red, then red-violet and finally blue-violet.

No. 253.—BENZIDINE-3, 3'-DICARBOXYLIC ACID



$C_{14}H_{12}N_2O_4$; Mol. Wt. 272.18; (C, 61.7%; H, 4.4%; N, 10.3%; O, 23.5%).

Derived from C. I. No. 444.

Precipitated from ammon. sols. by Ac HO in fine needles. Chars about 250°. Sp. sol. in boiling alc. or ether.

On boiling in glycerine, or by the distillation of its Ba salt, it is converted into benzidine.

The hydrochloride precipitates on adding dil. HCl.

Diacetyl deriv., mpt. approx. 300°, insol. in alc. or

ether; *dibenzoyl deriv.*, mpt. 302-4°. Its ammon. salt ($+2H_2O$) yields the acid at 160°.

By oxidation with alk. $K_3Fe(CN)_6$ it yields a red-brown azoxy dye, difficultly sol. in hot H_2O giving an orange solution.

RECENT PATENTS

Process for the Reduction of Azo Compounds to Hydrazo Compounds (Nickel Catalyst).—Oliver W. Brown, of Bloomington, Ind., and Clyde O. Henke, of South Milwaukee, Wis., assignors to the Newport Company, of Carrollville, Wis. No. 1,589,936; June 22, 1926.

Triazo Dyestuffs and Process of Making Same.—August Leopold Laska and Fritz Weber, of Offenbach-on-the-Main, Germany, assignors to Corporation of Chemische Fabrik Griesheim-Elektron, of Frankfort-on-the-Main, Germany. No. 1,590,042; June 22, 1926.

Violet Vat Dyestuffs of the 2-Thionaphthene-2-Indolindigo Series.—Richard Herz and Walter Brunner, of Frankfort-on-the-Main, Germany, assignors to Grasselli Dyestuff Corporation, of New York. No. 1,590,685. June 29, 1926.

Dyestuffs Containing Metals and Process of Making Same.—Eighteen claims. Fritz Straub, of Basel, and Hermann Schneider, of Riehen near Basel, Switzerland, assignors to Society of Chemical Industry in Basle, of Basel, Switzerland. No. 1,590,482; June 29, 1926.

Vat Sulphide Dyes.—Fritz Ballauf, Friedrich Muth and Albert Schmelzer, of Elberfeld, Germany, assignors to Grasselli Dyestuff Corporation, of New York. No. 1,590,718; June 29, 1926.

Manufacture of Yellow Azo Dyestuffs.—August Dorrer, of Ludwigshafen-on-the-Rhine, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-the-Main, Germany. No. 1,590,728; June 29, 1926.

Black Disazo Cotton Dye.—(Combining the diazo-compounds of unsulphonated aryl-azo-1-naphthylamin with arylamids of 2.3-hydroxynaphthoic acid.) August Leopold Laska and Arthur Zitscher, of Offenbach-on-the-Main, Germany, assignors to the Corporation of Chemische Fabrik Griesheim-Elektron, of Frankfort-on-the-Main, Germany. No. 1,592,604; June 13, 1926.

Azo Dyes Containing a Diphenylurea Nucleus.—(Green cotton dye and material dyed therewith.) Henry Wenker, of Hamburg, N. Y., assignor to National Aniline & Chemical Company, Inc., of New York. No. 1,594,805; August 3, 1926.

Disazo Dyestuffs Containing a Diphenylurea Nucleus.—Leon W. Geller, of Hamburg, N. Y., assignor to National Aniline & Chemical Company, Inc., of New York. No. 1,594,828; August 3, 1926.

Azo Dyes Derived from Monoacylacetyl Bodies and Process of Making Same.—Arthur Zitscher, of Offenbach-on-the-Main, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-the-Main, Germany. No. 1,594,865; August 3, 1926.

Blue Monoazo Dyestuffs for Wool or Silk

(1,586,693; June 1, 1926)

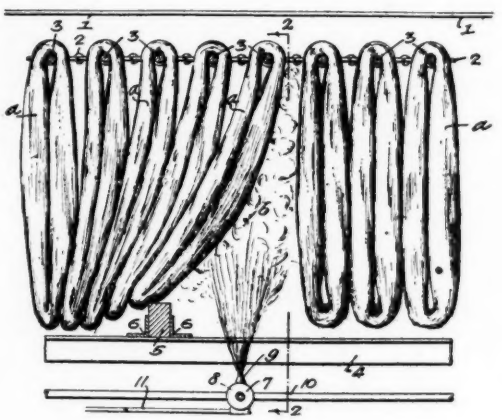
Adolphe H. Ney, New York, N. Y., assignor to Theodore Haebler, New York, N. Y.

As a new product, the monoazo dyestuff, obtained by coupling an an alkaline solution the diazo compound of 1:aminodiphenylamin-3; sulphonic acid with 1:acetylamino-8; hydroxy-naphthalene-3:6 sulphonic acid (acetyl-H-acid).

Apparatus for Conditioning and Cooling Yarn

(1,587,384; June 1, 1926)

Frederick Kershaw, Philadelphia, Pa., assignor to Proctor & Schwartz, Inc., Philadelphia, Pa.



The combination in an apparatus for conditioning and cooling yarn, of a casing; conveyor chains at each side of the casing; transverse sticks mounted on the chains from which the hanks of yarn are suspended; a transverse retarding bar located in the path of the lower ends of the hanks of yarn so as to retard all of the hanks of yarn suspended from a single stick; and means for projecting sprays of fluid onto the sides of the yarn on each side of the opening formed by the retarded hanks of yarn.

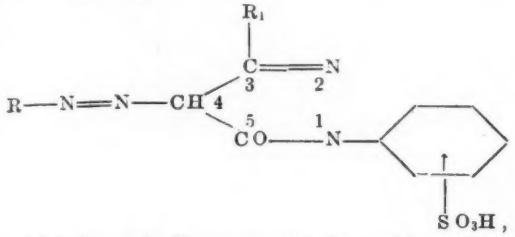
Yellow Monoazo Dyestuffs and Process of Making Same

(1,587,005; June 1, 1926)

August Leopold Laska and Fritz Weber, Offenbach-on-the-Main, Germany, assignors to Corporation

of Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany.

As new compounds yellow monoazo dyestuffs, corresponding probably in the state of free acids to the general formula:



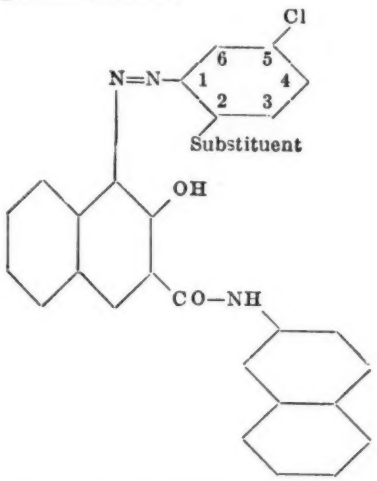
in which formula R represents the residue of a body of the diphenyl series, R_1 represents the group CH_3 or COOH, which dyestuffs are when dry yellow powders, soluble in water to a yellow solution, yielding on reduction with stannous chloride a monoamin of the diphenyl series and a 4-amino-1-sulphoaryl-5-pyrazolon body and dyeing wool in yellow shades, especially fast to milling.

Azo Dyestuffs and Process of Making Same

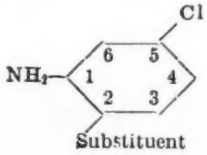
(1,587,004; June 1, 1926)

August Leopold Laska and Arthur Zitscher, Offenbach-on-the-Main, Germany, assignors to Corporation of Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany.

As new compounds the azo dyestuffs having probably the general formula:



which are when dry yellowish red to claret-red powders, soluble in sulphuric acid to a violet solution, yielding upon reduction with stannous chloride an anilin-derivative of the formula:



and *3-naphthalid* of 1-amino-2-hydroxy-naphthalene-3-carboxylic acid, adapted, when mixed with the usual substrata, for the production of valuable color lakes and yielding, when produced on the fiber, dyeings, which are distinguished by clearness of shade and excellent fastness, particularly to kier-boiling.

Method of Sizing Cellulose Fibers

(1,589,947; June 22, 1926)

Judson A. De Cew, New York, N. Y.

A method of sizing paper, which consists in adding the size and alum to the paper stock after the fibers of said stock have passed through the Jordan.

Manufacture of Colored Cellulose Plastics and Solutions Thereof

(1,589,700; June 22, 1926)

Carl Immerheiser, Ludwigshafen-on-the-Rhine, Carl Neubauer, Mannheim, and Erwin Scharf, Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin- & Soda-Fabrik, Ludwigshafen-on-the-Rhine, Germany.

The process of manufacturing colored cellulose plastics which comprises incorporating in a cellulose ester plastic a coloring matter, so that the coloring matter is in a colloidal condition, and does not tend to settle out from a solution of the said plastic, even after considerable dilution said coloring matter being practically insoluble in a solvent to be applied to the plastic mass when coloring it or making it into a solution.

Process of Improving Artificial Silk, Staple Fibers, and Textiles Made Therewith

(1,591,922; July 6, 1926)

Hans Karplus, Frankford-on-the-Main, Germany.

A process of improving artificial silk composed essentially of hydrated cellulose which comprises treating the same with formaldehyde and with a non-acid compound of an alkali-forming metal of a concentration incapable of injuring the artificial silk, and thereafter heating the so treated artificial silk, to temperatures between about 120 and 170 deg. Cent.

Purification of Anthraquinone

(1,591,712; July 6, 1926)

Harry F. Lewis, Buffalo, N. Y., assignors to National Aniline & Chemical Company, Inc., New York N. Y.

The method of purifying impure anthraquinone, which contains impurities of the type produced by oxidation of anthracene with chromic-sulfuric acid solution which comprises subjecting said impure anthraquinone without preliminary treatment with sulfuric acid to extraction with a hot alkaline solution and separating the resulting solution of impurities from the undissolved purified anthraquinone.

RESEARCH CHEMISTS ANALYZE SOAPS AND OILS AS CHIEF CAUSE OF ODORS

Odors in the cloth after it is finished, sometimes not becoming particularly apparent until after the fabrics are shipped, are a problem often encountered by woolen mills. According to the Research Department of the Procter & Gamble Company, these odors generally emanate from two sources — soap or oil. The analysis made by the chemists of this organization further states that as a rule, the most commonly met with odor is due to the presence of soap that has not been completely removed from the yarn or pieces before dyeing. A mill may be running continuously on one kind of fabric, exercising the greatest care in handling the wool from the bale until the cloth leaves the presses and yet find an odorous piece here and there.

At some time during the handling, if the yarn or pieces are suddenly immersed in a cold water wash upon being removed from a soap scour, a persistent soapy odor will cling to the wool. This has been observed to happen where the goods have been removed from the fulling mills and plunged into cold water. Again, if too strong a soap solution has been used in the scouring and afterwards the rinsing done with too small volume of water at too low a temperature, a soapy odor will result. Rinsing, to be effective, must be done with soft water and at a little more than lukewarm temperature. A good rinsing temperature is 110 deg. Fahr.

If the soapy odor in the cloth appears in every piece then the difficulty may be attributed to the soap itself. It seems to be the property of some soaps to "hang on" even though the fabrics have been apparently thoroughly scoured. Under these circumstances, the manufacturer will find it to his advantage to change soaps.

In the case of oily odors, the remedy is in scouring the goods repeatedly and in guarding against the use of wool oils that have a pronounced odor. In order to card and spin wool stock it is necessary to add oils mixed with water and a milk alkali, so as to lubricate the fibres, making them more pliable. This prevents damage to the fibres in carding, minimizes waste and facilitates spinning. Olive, lard and red oils or mixtures of these with different mineral oils are generally used. Most oily odors are due to these mixtures. Naturally they are lower in cost, but in the long run are poor economy if extra time is required in the washroom to get fabrics clean or streaked dyeing is a result.

AFTER-TREATMENT OF SILK PIECES

The after-treatment of dyed silks has for its object the increase in fastness of the dyed shade. The most common process for this purpose is that based upon the use of tannic acid and antimony salt. The dyed silk is entered into a bath heated to 120 deg. to 140 deg. Fahr., and allowed to remain immersed overnight. This bath contains from 4 to 12 ounces of tannic acid per 10 gallons. In the morning, the goods are wrung out or whizzed and then immersed for half an hour in a fresh bath heated to 85 deg. Fahr., containing from 2½ to 6 ounces of antimony salt per 10 gallons. Afterwards soap lukewarm, rinse and brighten.

Some dyers give a supplementary passage of from 20 to 30 minutes through a bath heated to 85 deg. Fahr., containing 3 per cent of tin crystals and 2 per cent of muriatic acid, afterwards soaping and rinsing.

There are many modifications of this process, but they are all about the same.—Dyestuffs.

NATIONAL ACADEMY OF SCIENCE RAISING LARGE RESEARCH FUND

The endeavors of the National Research Endowment of the National Academy of Science to raise $20,000,000 for pure science research, under the direction of a board of trustees composed of a notable group of men and presided over by Herbert Hoover as chairman, have the unqualified support of several well-known industrial executives. Among these General J. J. Carty, vice-president of the American Telephone & Telegraph Company, and Frank B. Jewett, president of the Bell Telephone Company, are most active in voicing their approval of the undertaking.

General Carty believes that "pure scientists are the advanced guard of civilization. By their discoveries, they furnish to the engineer and industrial chemist and other applied scientists the raw material to be elaborated into manifold agencies for the amelioration of the condition of mankind." The general is emphatic in his opinion that "unless the work of the pure scientist is continued and pushed forward with ever increasing energy, the achievements of the industrial scientist will diminish and degenerate."

The ambitions and aims of the National Research Endowment are among the most constructive and progressive of the present day. Its purpose is to increase and strengthen American contributions to the mathematical, physical and biological sciences by the creation of a national fund for skilled investigators, who will be selected by the best qualified authorities in the National Academy of Sciences, from among the ablest and most productive investigators engaged in pure science research.

To research in pure science we owe such products as the chemical industries are now producing synthetically from coal tar distillate, such as dyestuffs, antiseptics, high explosives, perfumes, flavors and medicinals of commerce. All of these are made possible only after years of painstaking research.

Frederick S. Bacon, formerly president of the Puritan Dye & Chemical Company, has joined the organization of Arthur D. Little, Inc., chemists, engineers and managers, of Cambridge, Mass.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

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Advertising Manager

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Vol. XV August 23, 1926 No. 14

THE A. C. S. DYE SYMPOSIUM

IT is a natural tendency to look back over the road one has travelled and if for nothing more than self-satisfaction, to recount the deeds of one's youth, be they wild oats or tame. Likewise, in its progress every industry arrives at certain milestones where it may replenish its vigor and enthusiasm by enumerating its more notable accomplishments, not only for its own satisfaction but for the benefit of its younger generation. Such an anniversary of the American dye industry will be marked in September by the celebration of the fiftieth birthday of the American Chemical Society at Philadelphia. The Dye Division of the society will contribute toward the discussion of half a century of progress in chemistry by holding a comprehensive symposium that will cover the "high spots" in the history and significance of the dye industry in this country. The gathering of dyestuff chemists will have an opportunity to survey their achievements in the important work of producing colors and chemicals from coal tar and applying them to textiles and other products—achievements, it must be remembered, that have furnished very essential resources for our national defense.

Dr. C. L. Parsons, secretary of the American Chemical Society, said in an address last week before the Institute of Politics that in the future that nation will wield the most power which has discovered the best methods of controlling its raw materials, for therein lie the resources of economic expansion. What part in augmenting the raw material resources of the country the dyestuff chemist has played only few appreciate, though few there be who do not receive the benefits of his work. Leaving out all considerations of chemical warfare materials, who can measure the social and economic importance of the dye industry to our textile mills? The place of the chemist in textile manufacture is too well known to require comment, but it is obvious that his endeavors in this field have only barely begun to show their effect. The future achievements of the dye chemist and the textile chemist will probably eclipse in magnitude all that has been done during the past fifty years. But a clearer conception of what has already been accomplished will give wings to the vision of those who are to form the next generation of chemists.

THE FALL AND RISE OF THE B. D. C.

AN outstanding example of the part that proper management can play in regaining the prestige and stability of an industrial corporation that has fallen to the level of a veritable financial and technical failure is the case of the British Dyestuffs Corporation. The history of the company's unsuccessful operation under the supervision of the British Government, its slow, uncertain progress in both manufacture and research, its recurrent internal disorders, resulting from a directorate inexperienced in managing such a highly technical enterprise, its enigmatic and futile attempts at amalgamation with the German dye trust and its final decline to a state of neutral influence in the dye industry of Great Britain, all present a distinct contrast to the upward course of the B. D. C. since its reorganization last year as an independent concern.

With a new directing board that includes some of the distinguished figures in British chemistry and with a controlling interest in Scottish Dyes, Ltd., it embarked with a hopeful spirit several months ago upon the difficult task of regaining its influence. It formulated a definite program of management involving the concentration of its plant facilities and adequate research work, to assure greater production at minimum cost and a steady development of new colors. Evidently this has been successful. The period of suspicion and criticism seemingly ended with its reorganization. The public's confidence in the future of the corporation is reflected in the encouraging report of the profits earned during the first half of its new existence and in the recent declaration of a dividend of 2½ per cent. Those who maintain that profitable dyestuff manufacture demands a skillful combination of technical and commercial brains can point to this case as one more instance of the successful application of their theory.

UNWORKABLE PATENTS

THE laxity of our patents laws in granting protection without requiring that a patent be worked in this country is often criticised. It is well known that advantage is taken of this laxity by foreign inventors, often with results injurious to American industry. Not the least important field invaded is that of dyes and chemicals, and were it not for the limitless scope for invention offered there, it would hardly be stretching one's imagination to picture America's chemical industry bounded north, east, south and west by foreign-owned patents.

As it is, a very large percentage of the chemical patents taken out here are owned by German companies.

In all fairness it must be admitted that the foreign inventor deserves some rights to his invention outside his own country. American inventors certainly desire equal privileges abroad. But the principal objection heard here is that many patents granted to foreigners are unworkable; and since they divulge very little information concerning the invention, their invalidity is not discovered. This condition was given some prominence during the legal discussion surrounding the sale of the alien dye and chemical patents to the Chemical Foundation. One of the significant arguments advanced by the defense was that nearly all of the patents taken over by the Foundation were in themselves valueless because they lacked sufficient information to work them. The same patents, nevertheless, had been giving excellent protection to their alien owners by rendering null all identical inventions of American chemists and were to some extent preventing the development of an adequate dye industry in this country.

In view of the importance of correcting such an evil, the attitude of the Patent Committee of the American Chemical Society in its recent letter to Secretary of Commerce Hoover is commendable. The committee earnestly advocates a definite ruling requiring demonstration of all chemical patents before they are granted. It is pointed out that the right to do this already exists and has often been exercised, but has apparently been overlooked or forgotten. If the practice of demonstrating the workability of patents can be made a rule instead of merely a privilige, the situation should be greatly relieved. But the practical difficulties in the way are insurmountable. Particularly in the case of chemical patents, the elaborate facilities sometimes needed in testing their validity are certainly not always available in the Patent Office laboratory. The demonstration of every patent filed would entail so much red tape and expense that the plan itself is "unworkable."

THE AMERICAN COTTON INDUSTRY

Production of cotton goods now employs more people than any other primary manufacturing industry in the United States, according to data compiled by the Association of Cotton Textile Merchants of New York, which shows the growth of the cotton textile industry in the last quarter century. On the basis of the latest manufacturing census forty per cent of those engaged in all textile manufacturing are employed in making cotton goods in mills now located in 31 States.

Since the beginning of the present century, the number of spindles in the cotton industry has nearly doubled and the value of the products has increased almost six times to more than $2,000,000,000.

Due to improvement in mechanical efficiency and better organization of the industry from a manufacturing viewpoint, production per operative has shown a marked increase. While actual production is double what it was twenty-five years ago, the number of employees has increased from 302,800 to about 497,000 or 64 per cent. Since 1900 the number of individual cotton cloth mills has increased from 1,005 to approximately 1,600, or about 60 per cent..

Today the amount of capital invested in the cotton manufacturing industry is estimated at more than $2,000,000,000, compared with $339,200,000 at the beginning of the present century, an increase of about 500 per cent. Neither the capital invested in the mills nor the total annual value of the cotton goods manufactured, however, provide an adequate index to the important position which the entire cotton industry occupies in this country.

In addition to the cotton which is actually manufactured into goods, more than half of the American crop is exported for manufacture in foreign mills. The 37,700,000 cotton spindles in the United States comprise 23.4 per cent of all the cotton spindles in the world, according to Department of Commerce figures. Foreign spindles are dependent to a large extent upon the United States for their supply of raw cotton since the United States produces approximately two-thirds of all the cotton grown in the world. .

Numerous by-products of the cotton industry are also of real economic importance. Cotton seed, utilized by industry for widely varying purposes, from feeding cattle to making salad oil and edible fats, was valued last year at the large total of $241,000,000, a figure which includes also the value of linters. Linters are the fine fibers, clinging to the seed after it is ginned, which are removed to provide material for stuffing mattresses and upholstery, for manufacture into rayon, etc.

As in the packing industry, modern efficiency methods have been developed for the utilization of every scrap of raw material; in the mills even the fine lint that settles upon the floors is scrupulously collected and sold. So-called "cotton waste" has an annual value, according to latest census figures, of approximately $37,000,000.

COAL-TAR EXPORTS KEEP UP IN FIRST HALF OF YEAR

The total exports of coal-tar products from the United States during the first half of 1926 were over $5,000,000, representing only a 1% per cent decline from the total for the same period of last year, according to the United States Department of Commerce. There were noticeable shifts in the specific commodities, however, benzol showing a large gain in value and dyes and stains a falling off of 19 per cent in value and of 6 per cent in quantity. The exports of dyes and stains, amounting to $2,857,000 (11,741,000 pounds), were only 6 per cent below the imports of $3,049,000 (2,726,000 pounds); the latter were one-third as much as in the corresponding period of 1925.

RECENT LITERATURE

Chemistry at Princeton in the Service of Civilization. Department of Chemistry, Princeton University. 21 pages. Illustrated.

Like the mountain springs from which the waterways of a nation have their rise, the university chemical laboratories of the country constitute the source from which we draw our men of science. Without the initial education, training and inspiration received in our colleges, the men who have been largely responsible for the mechanical and social progress of the United States could have achieved but little—if anything—in their work of creating and adding to our fund of scientific knowledge. Now a great educational institution, recognizing the far-reaching importance of its present though inadequate facilities for the training of future scientists, sends out a call for the financing of a new chemistry building, and embodies its message in a handsome brochure. Herein are told the facts about Princeton's Department of Chemistry, what it has done and is doing, what it proposes and hopes to do. The nature of the undergraduate instruction and graduate work is explained interestingly; statistics are given to show the growth of the chemistry department, its material facilities and equipment; plans and sketches show the proposed new building. The importance of such an educational unit is further emphasized by a list of the noted men composing the personnel of the department.

Transportation Costs and Costs of Production. United States Tariff Commission. 94 pp.

The information in this report on the relation of transportation costs to costs of production was compiled for the purposes of Section 315 of the Tariff Act of 1922. It contains a full statement of the reasons in favor of the view that the President is authorized to include transportation costs with costs of production under provisions of Section 315, as well as reasons against such inclusion, and a complete legislative history of the subject, including statements in the Senate and House of Representatives. It closes with the text of the opinion of the Attorney General upon the controversy.

Year Book, American Engineering Standards Committee, 1926. 76 pp.

"Standardization is dynamic, not static. It means, not to stand still, but to move forward together" reads the epigram on the title page of this year book, and the succeeding text presents the evidence to show standardiaztion is helping industry to "move forward."

Industrial standardization consists in singling out specific products and materials, in settling upon their properties and dimensions, and in concentrating upon them both in production and use — all to the end of bringing about the greatest possible industrial efficiency. Its advantages, which are only beginning to be thoroughly understood, are manifold, and the benefits to industry and to the public as a whole have so far been remarkable.

The movement toward standardization of industrial products has been considerably extended during the past year; and savings from standardization work are constantly growing in magnitude. More than 200 definite standardization projects are in process or completed under the auspices of the A. E. S. C., and 365 national trade associations, technical societies and government bureaus are co-operating in the work through some 1600 represeptatives. It is to be regretted, however, that the dyestuff and textile industries are not prominently represented in this effort.

The outstanding developments in A. E. S. C. work during 1925 are described, and the purposes and organization of the Committee and its methods of work are fully explained by means of text and chart.. The information service and membership of the A. E. S. C., its relation to other industrial associations. Government co-operation with its work, and its co-operation in turn with foreign and domestic standardizing bodies, are some of the topics treated, and a complete list is given of the standardizing projects that have been undertaken.

NEW BOOKS IN S. O. C. M. A. LIBRARY

The following new books have been added to the library of the Synthetic Organic Chemical Manufacturers' Association and will be loaned to members upon request:

Digest of Patents; Coal-Tar Dyes and Allied Compounds. By Aida M. Doyle, special agent of the Bureau of Census. Contains abstracts of patents issued prior to January 1, 1924, arranged by chemical groups; indexed according to patentee, assignee, color and intermediates used; also cross-reference index of numbers and names in Schultz.

Electro-Organic Chemistry. By C. J. Brockman. The book covers the selective oxidation and reduction of organic compounds by electrolytic means, choice of solvent, electrolytes and electrode materials for oxidation, reductions and substitution reactions in organic electro-chemistry.

Dix Ans d'Efforts Scientifique, Industriels et Coloniaux. Published by Chimie et Industrie. Vol. I. History of applied chemistry in France since 1914.

Annual Reports of the Society of Chemical Industry. Vol. X.

Pamphlet: *Health Hazard of Benzol.* Final report of

the Committee of Chemical and Rubber Section, National Safety Council, May, 1926.

Commerce Year Book. The Chemical Division of the Bureau of Foreign and Domestic Commerce calls attention to the publication of the *Commerce Year Book*, 1925. This book contains the complete and authentic record of American trade and industry for 1925, comprising a resume of production, employment, domestic trade and prices; surveys of the different commodities; discussions of transportation and communication, finance, banking and foreign trade; and economic surveys of the principal foreign countries. (Copies of this book may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a cost of $1 each.)

Foreign Dyes Imported Through New York and Other Ports During July

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

IMPORTS of foreign coal-tar dyes through New York and other ports during the month of July totaled 351,425 pounds, with an invoice value of $303,079. Imports by ports were as follows: New York, 343,100 pounds, valued at $294,031; Albany, 6,581 pounds, valued at $6,923; Boston, 1,258 pounds, valued at $1,751; Philadelphia, 486 pounds, valued at $374.

Five Leading Dyes, by Quantity, Imported During July, 1926

	Pounds
Ciba Scarlet G (single strength)	22,357
Ciba Red R (single strength)	13,006
Vat Red Violet RH (single strength)	12,460
Brilliant Indigo 4B (single strength)	11,873
Rhodamine B (single strength)	11,375

Imports of Synthetic Dyes

	1926		1925	
	Pounds	Invoice Value	Pounds	Invoice Value
January	190,459	$184,018	403,984	$359,376
February	479,027	477,255	373,259	365,268
March	487,804	435,891	527,964	488,501
April	437,526	401,606	451,005	426,141
May	392,739	343,745	370,271	347,904
June	333,319	317,896	376,668	333,654
July	351,425	303,079	420,849	400,366
Total	2,672,299	$2,463,490	2,924,000	$2,721,210

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
July 31, 1925	775,916	1,378,837
August 31, 1925	767,431	1,363,760
September 30, 1925	709,381	1,359,717
October 31, 1925	609,750	1,055,241
November 30, 1925	521,238	746,226
December 31, 1925	633,525	758,618
January 31, 1926	703,159	763,409
February 28, 1926	596,154	855,170
March 31, 1926	447,588	896,530
April 30, 1926	359,164	928,593
May 31, 1926	535,226	946,120
June 30, 1926	671,396	772,475

Per Cent of Dyes by Country of Shipment

	1926			
	July	June	May	April
Germany	60.0	51.5	60.0	51.5
Switzerland	30.0	36.0	28.0	38.0
France	2.7	1.0	1.0	2.0
England	1.4	7.5	3.0	2.0
Belgium	4.0	3.0	5.5	3.5
Canada	—	0.5	0.5	1.0
Italy	1.5	0.5	1.0	2.0
Holland	—	—	1.0	—
All others	0.4	—	—	—

Imports of Color Lakes

	Pounds	Invoice Value
January	2,773	$2,393
February	143	....
March	58	....
April	834	....
May	3,360	3,077
June	2,720	1,598
July	2,844	1,877

The dyes in this report are grouped by both Colour Index and Schultz numbers, and, in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
10	7	Naphthol Yellow SXX—(IG)	200
16	137	Fast Yellow S—(IG)	50
32	182	Brilliant Sulphon Red B—(S)	1,000
80	83	Scarlet 3R—(IG)	50
105	88	Acid Anthracene Brown R—(IG)	100
127	118	Geranine G—(By)	100
165	153	Lake Red C—(Q)	1,134
172	159	Acid Alizarine Black R—(IG)	1,000
276	248	Wool Fast Sacrlet R Conc.—(G)	55
288	256	Sulphon Cyanine G—(IG)	1,500
316	273	Blue NA—(IG)	833
317	274	Developing Black B—(IG)	100
324	—	Diazo Brilliant Orange GR Extra—(By)	485
325	—	Diamine Fast Violet FFBN—(C)	441
326	279	Benzo Fast Scarlet 5BS—(IG)	200
327	—	Benzo Fast Scarlet 4BS—(By)	420
346	296	Cotton Yellow G Extra—(IG)	100
357	300	Brilliant Carmine L Conc.—(IG)	500
382	319	Chloramine Red B—(S) Chloramine Red 3B—(S)	1,992
409	339	Diamine Orange B—(IG)	100
440	360	Ignamine Orange R—(IG)	500
487	400	Brilliant Milling Red R—(C) Milling Scarlet 4R Conc.—(IG)	300
577	457	Trisulphon Brown 2G Conc.—(S)	2,000
591	472	Chloramine Blue HW—(S)	2,000
593	474	Diamine Green B—(IG)	5
594	475	Diamine Green G—(IG)	55
596	476	Benzo Chrome Brown G—(IG) Dianil Chrome Brown G—(M)	200
631	14	Diphenyl Chrysoine GC—(G)	4,409
636	19	Fast Light Yellow 3G—(By)	800
654	—	Developed Light Yellow 2G Powder—(By)	276
667	503	Poseidon Green SGX—(IG)	1,000
670	505	Light Green SF Yellowish XX—(IG)	500
673	508	Xylene Blue AS Conc.—(S)	2,000
677	512	Magenta AB Powder—(IG)	1,000
682	518	Ethyl Violet—(Q)	200
691	523	Fast Green Extra Bluish—(By)	5,288
692	524	Acid Magenta II—(BDC)	25
707	539	Soluble Blue T—(IG)	100
710	541	Betamine Blue 8BL Extra—(IG) Brilliant Dianil Blue 6G—(IG)	212
712	543	Patent Blue V—(IG)	1,500
714	545	Brilliant Acid Blue A—(IG) Neptune Blue BR Conc.—(IG) Patent Blue A Powder—(M)	1,581
715	546	Cyanol Extra—(C)	682
717	548	Acid Violet 6BNOO—(IG)	100
720	551	Chromoxane Brilliant Blue G—(By)	200
723	554	Chrome Azurol S Conc.—(G) New Victoria Blue B—(By) Victoria Blue R Base—(I)	761
729	559	Victoria Pure Blue BO—(IG)	1,500
748	579	Sulpho Rhodamine B—(M)	164
749	573	Rhodamine B Conc. (s. s.)—(G) Rhodamine B Extra (s. s.)—(B) Rhodamine B Extra (s. s.)—(IG)	11,375
750	572	Rhodamine G Extra (s. s.)—(I)	1,100
751	574	Rhodamine 3B Extra (s. s.)—(I)	550
752	571	Rosazeine 6G Extra (s. s.)—(IG)	1,250
757	580	Fast Acid Violet B—(IG)	300
766	585	Fluorescein—(M) Fluorescein—(Merck)	25
773	592	Erythrosine A Extra Pure—(IG)	25
787	—	Coriphosphine OX Extra—(IG)	500
789	—	Patent Phosphine M—(I)	2,204
793	606	Phosphine O—(IG) Phosphine 3R—(IG)	200
795	607	Runic AL Conc.—(IG)	300
801	613	Quinoline Yellow Extra—(IG)	100

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
829	673	Rosinduline 2B Bluish—(K)	912
833	—	Benzyl Fast Blue GL—(I)	
		Xylene Milling Blue AE Conc.—(S)	
		Xylene Milling Blue BL Conc.—(S)	2,699
865	700	Nigrosine T—(B)	
		Silver Gray P—(IG)	525
873	681	Direct Gray R Paste—(G)	948
875	923	Fur Blue Black A—(IG)	
		Fur Blue Black SA—(IG)	
		Fur Brown NZD—(IG)	
		Fur Brown P—(IG)	
		Fur Gray B, G, R—(IG)	
		Nako PS, RH, 3GA—(IG)	
		Nako Black ST—(IG)	1,910
924	660	Methylene Green W—(G)	4,410
969	748	Hydron Blue R Powder (s. s.)—(IG)	333
971	748	Hydron Blue G Powder (s. s.)—(IG)	333
1006	746	Pyrogene Green 3G—(I)	441
1019	774	Alizarine Black S Paste—(IG)	1,391
1027	778	Alizarine VL Extra Pure Paste—(IG)	6,615
1033	779	Alizarine Orange RP Paste—(IG)	1,200
1034	780	Alizarine Red W Powder—(By)	184
1053	—	Alizarine Sapphire Blue SE—(I)	
		Alizarine Light Blue SE Conc.—(S)	440
1054	858	Alizarine Light Blue B—(S)	
		Alizarine Light Blue B Conc.—(S)	6,544
1059	800	Anthracene Blue WB Paste—(IG)	445
1064	—	Alizarine Cyclamine R Paste—(IG)	800
1071	808	Alizarine Green S Paste—(IG)	838
1073	852	Alizarine Blue JR Powder—(By)	
		Alizarine Irisol—(IG)	135
1075	856	Alizarine Astrol—(IG)	
		Alizarine Blue AS—(By)	320
1076	859	Alizarine Direct Blue RXO—(IG)	
		Alizarine Light Blue R Conc.—(S)	700
1077	860	Alizarine Direct Blue BGAOO—(IG)	1,300
1078	865	Alizarine Cyanine Green G Ex. Pdr.—(IG)	
		Alizarine Light Green GS Conc.—(S)	2,958
1080	853	Anthraquinone Violet—(B)	220
1084	854	Alizarine Viridine FF Paste—(IG)	1,985
1085	862	Alizarine Blue Black B Powder—(IG)	200
1088	855	Alizarine Blue SKY Powder—(By)	
		Alizarine Sky Blue B Powder—(By)	
		Alizarine Sky Blue B Powder—(IG)	5,036
1091	—	Alizarine Rubine R Powder—(By)	
		Anthra Rubine B Powder—(K)	881
1095	759	Anthra Yellow GC Paste Fine—(IG)	2,406
1096	760	Vat Golden Orange G Double Paste Fine (s. s.)—(IG)	
		Vat Golden Orange G Double Paste (s. s.) —(B)	5,098
1099	763	Vat Dark Blue BOA Paste Fine—(IG)	
		Vat Dark Blue BGO Paste Fine—(IG)	957
1102	765	Vat Black BB Powder (s. s.)—(B)	2,143
1106	838	Vat Blue RS Dbl. Pst. Fine (s. s.)—(IG)	1,000
1113	842	Cibanone Blue GCD Dbbl. Pst. (s. s.)—(I)	
		Indan. Blue GCD Dbl. Pst. (s. s.)—(B)	7,238
1113	842	Sandothene Blue NGCD Paste—(S)	50
		Sandothene Blue NGCD Powder—(S)	100
1115	843	Cibanone Blue G Paste—(I)	
		Vat Blue RC Paste—(I)	665
1118	849	Sandothene Yellow NG Powder (s. s.)—(S)	
		Vat Yellow G Powder (s. s.)—(IG)	1,240
1120	867	Anthra Brown B Paste—(B)	852
1133	819	Algol Red R Extra Powder (s. s.)—(IG)	1,600
1135	820	Vat Brilliant Violet RK Paste—(By)	110
1138	810	Vat Yellow 3GN Powder (s. s.)—(IG)	230
1144	870	Vat Corinth BB Powder (s. s.)—(Gr)	880
1146	828	Anthra Bordeaux B Dbl. Pst. (s. s.)—(IG)	800
1150	833	Vat Olive R Paste—(IG)	3,998
1151	—	Vat Brown R Paste—(IG)	2,000
1152	—	Vat Brown B Paste—(Gr)	
		Vat Brown G Powder (s. s.)—(IG)	4,294
1156	825	Algol Red B Paste—(IG)	400
1161	871	Vat Red Violet RRK Powder (s. s.)—(IG)	800
1162	831	Helindone Red DIBN Extra Paste—(B)	
		Vat Red RK Paste—(B)	1,062
1169	792	Cibanone Orange R Paste—(I)	2,204
1173	793	Cibanone Blue 3G Paste—(I)	5,511
1178	876	Indigosol O—(By)	100
1184	881	Brilliant Indigo BASF Paste—(By)	
		Brilliant Indigo 4BC—(IG)	
		Brilliant Indigo 4B Powder (s. s.)—(B)	11,873
1186	883	Indigo MLB 6B Powder (s. s.)—(IG)	3,000
1190	885	Brilliant Indigo B Paste—(IG)	5,072
1196	890	Ciba Yellow G Paste—(I)	110
1207	912	Anthra Red B Paste—(IG)	500
1209	917	Helindone Red B Paste—(IG)	
		Helindone Red B Powder (s. s.)—(IG)	350
1211	910	Helindone Pink AN Paste—(IG)	
		Anthra Pink AN Paste—(IG)	4,000
1212	918	Vat Red Violet RH Paste—(IG)	
		Ciba Red 3B Powder (s. s.)—(I)	12,460
1213	921	Vat Gray 6B Powder (s. s.)—(IG)	125
1218	915	Vat Scarlet R Paste—(IG)	200
1228	907	Ciba Scarlet G Extra Paste—(I)	
		Ciba Scarlet G Extra Powder (s. s.)—(I)	
		Anthrascarlet GG Paste—(IG)	22,357
1229	908	Ciba Red R Paste—(I)	
		Helindone Fast Scarlet C Paste—(IG)	13,006

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Rhodamine BG Powder—(IG)	220
Alizarine Astrole Violet B 40%—(IG)	100
Alizarine Direct Blue A2G 36%—(IG)	300
Alkali Blue 6R Extra—(IG)	50
Alkali Fast Green 10G—(IG)	500
Alphanol Blue BRN Conc.—(IG)	200
Alphanol Brown B—(IG)	5
Azo Acid Black B—(IG)	500
Brilliant Milling Blue B—(IG)	2,220
Brilliant Scarlet N—(IG)	1,000
Brilliant Silk Blue B—(I)	110
Brilliant Wool Blue FFR Extra—(IG)	500
Cashmere Black TN—(By)	706
Chrysoline AG Extra—(IG)	25
Fast Acid Green BB Extra—(IG)	100
Guinea Fast Red BL—(A)	1,000
Guinea Rubine 4R—(IG)	300
Kiton Fast Red 4BL—(S)	441
Milling Orange G—(IG)	300
Milling Red GA—(IG)	200
Milling Yellow 3G—(IG)	150
Milling Yellow HG—(IG)	50
Minaxo Acid Brown G—(IG)	500
Neolan Blue B—(I)	1,322
Neolan Blue GG—(I)	2,425
Neolan Pink G—(I)	1,763
Onis B—(IG)	100
Polar Orange R Conc.—(G)	1,102
Polar Yellow 2G Conc.—(G)	1,764

Name of Dye and Manufacturer	Quantity (pounds)
Silk Yellow R—(IG)	100
Sulphon Rhodamine G—(M)	121
Sulphon Yellow 5G—(IG)	150
Sulphon Yellow R—(IG)	50
Supramine Blue FB—(IG)	100
Supramine Blue R—(IG)	200
Supramine Brown G—(IG)	100
Supramine Red B—(IG)	500
Supramine Red 2G—(IG)	100
Supramine Yellow R—(IG)	200
Wool Blue R Extra—(By)	100
Xylene Milling Orange R Conc.—(S)	500

Vat Dyes

Alizarine Indigo 5R Paste—(IG)	500
Anthra Pink R Extra Paste Fine—(IG)	3,000
Ciba Pink BG Powder (s. s.)—(I)	550
Cibanone Orange 6R Powder—(I)	110
Helindone Blue B Powder—(IG)	50
Helindone Pink R Extra Paste—(IG)	2,500
Helindone Printing Black RD Paste—(IG)	7,500
Hydron Brown G Paste—(C)	800
Hydron Brown G Powder (s. s.)—(IG)	354
Hydron Brown R Paste—(IG)	500
Hydron Green G Paste—(IG)	100
Hydron Pink FB Powder (s. s.)—(IG)	894
Hydron Pink FF Paste—(IG)	500
Hydron Scarlet 2B Paste—(IG)	376
Hydron Scarlet 3B Powder (s. s.)—(IG)	1,320
Hydron Sky Blue FK Paste—(IG)	500
Hydron Violet BF Paste High Conc.—(IG)	100
Indigosol AZG—(DH)	22
Indigosol Orange HR—(IG)	50
Indigosol O4B—(DH)	320
Indigosol Pink HR Extra—(IG)	50
Indigosol Red HR—(DH)	22
Indigosol Scarlet HB—(DH)	22
Vat Black B Paste for Printing—(IG)	567
Vat Blue 8GK Paste—(IG)	200
Vat Blue Green B Double Paste (s. s.)—(IG)	1,000
Vat Brilliant Blue R Paste Fine—(IG)	966
Vat Brilliant Blue R Powder (s. s.)—(IG)	800
Vat Brilliant Violet 4R Paste—(IG)	200
Vat Brown 2G Paste—(IG)	1,199
Vat Gray RRH Powder (s. s.)—(IG)	900
Vat Gray RRH Paste—(IG)	500
Vat Green GG Powder (s. s.)—(IG)	400
Vat Green GG Double Paste (s. s.)—(IG)	992
Vat Khaki GG Paste—(IG)	5,380
Vta Orange 4R Powder (s. s.)—(IG)	1,570
Vat Pink B Double Paste (s. s.)—(IG)	4,086
Vat Printing Brown R Paste—(IG)	2,893
Vat Printing Red B Paste—(IG)	200
Vat Printing Red G Paste—(IG)	300
Vat Red 2B Powder (s. s.)—(IG)	880
Vat Red Brown R Paste—(IG)	698
Vat Yellow FFRK Powder (s. s.)—(IG)	400
Vat Yellow RK Powder (s. s.)—(IG)	500
Vat Yellow 3RT Conc. Powder (s. s.)—(IG)	500
Vat Yellow Brown 3G Paste—(IG)	1,200
Acid Alizarine Gray G—(IG)	60
Acid Anthracene Brown PG—(IG)	2,049
Alizarine Brown HD Paste—(IG)	100
Alizarine Fast Gray 2BL Powder—(IG)	500
Anthracene Brown PG—(IG)	551
Brilliant Chrome Blue S Powder—(IG)	110
Chromazurine DN—(IG)	110

Name of Dye and Manufacturer	Quantity (pounds)
Chromorhodine 6GN Extra—(IG)	220
Chromoxane Brilliant Violet BD—(IG)	100
Chromoxane Brilliant Violet SB—(By)	450
Chromoxane Pure Blue B—(By)	993
Eriochrome Brilliant Violet B Supra 1060—(G)	551
Eriochrome Brown SWN Supra 1061—(G)	55
Eriochrome Geranol R Conc. 991—(G)	220
Eriochrome Red G 978—(G)	1,653
Eriochrome Violet 3B 941—(G)	110
Eriochrome Yellow G Paste—(G)	981
Metachrome Blue Black 2BX—(IG)	1,276
Metachrome Brown 6G—(IG)	500
Metachrome Olive 2G—(IG)	500
Metachrome Red G—(IG)	200
Naphtho Chrome Violet R—(IG)	220
Pilatus Fast Black GG—(IG)	100
Pilatus Fast Blue GR—(IG)	200
Pilatus Fast Pink G—(IG)	50
Radio Chrome Blue B—(IG)	500

Direct Dyes

Benzo Chrome Black Blue B—(IG)	100
Benzo Chrome Brown B—(IG)	200
Benzo Fast Blue 8GL—(IG)	500
Benzo Fast Brown RL—(IG)	950
Benzo Fast Brown 3GL—(IG)	1,000
Benzo Fast Copper Violet B—(IG)	25
Benzo Fast Eosine BL—(IG)	100
Benzo Fast Heliotrope 5RH—(IG)	100
Benzo Fast Light Scarlet 4BL—(IG)	100
Benzo Fast Yellow RL—(IG)	500
Benzo Green G—(IG)	100
Benzo Rhoduline Red B—(IG)	200
Benzo Violet RL Extra—(IG)	25
Brilliant Benzo Green B—(IG)	100
Brilliant Fast Blue 3BX—(IG)	500
Brilliant Pure Blue B Powder—(By)	646
Brilliant Pure Yellow 6G Extra—(By)	110
Brilliant Sky Blue 8G Extra—(By)	1,146
Brilliant Sky Blue 2RM—(By)	1,764
Brilliant Triazol Fast Violet BL Powder—(Gr)	112
Chlorantine Fast Brown 3RL—(F)	2,205
Chlorantine Fast Violet 5BL—(I)	2,204
Chlorazol Drab RH—(BD)	200
Chlorazol Fast Orange HG—(BD)	500
Developed Brilliant Green 3G—(By)	276
Developed Brilliant Orange 5GX—(By)	130
Developed Brilliant Scarlet 2BL Ex. Conc. Pdr.—(By)	440
Developing Blue B—(IG)	200
Diamine Azo Brown 3G—(C)	229
Diamine Azo Fast Violet R—(C)	266
Diamine Catechine 3G—(IG)	300
Diamine Dark Blue B—(IG)	50
Diamine Dark Green N—(IG)	5
Diamine Fast Brown GBB—(IG)	100
Diamine Fast Orange ER—(C)	986
Diaminogen GG—(C)	4,331
Dianil Fast Violet BL—(IG)	200
Diazanil Pink B—(IG)	100
Diazo Brilliant Green 3G—(IG)	1,651
Diazo Brilliant Orange 5G Extra—(IG)	960
Diazo Brilliant Scarlet 2BL Extra Conc.—(By)	441
Diazo Fast Black SD—(IG)	576
Diazo Fast Blue 6GW—(IG)	441
Diazo Fast Green GF—(IG)	700
Diazo Indigo Blue 4GL Extra—(By)	500
Diazo Rubine B—(By)	200

Name of Dye and Manufacturer	Quantity (pounds)
Diazo Sky Blue B—(By)	1,997
Diazo Sky Blue 3GL—(By)	500
Direct Sky Blue 8G Extra Powder—(By)	440
Formal Fast Black G Conc.—(G)	110
Half Wool Blue G—(IG)	320
Half Wool Blue 3R—(IG)	500
Minaxo Light Pink BBX—(IG)	200
Para Black V—(IG)	250
Para Orange G—(IG)	50
Polyphenyl Blue GC—(G)	551
Sky Blue N—(IG)	300
Zambesi Black V—(Gr)	500
Dyes for Artificial Silk	
Artificial Silk Black R—(IG)	300
Azonine Direct Blue B Paste—(IG)	300
Blue Extra Paste for Acetate Silk—(IG)	100
Ceres Yellow I—(IG)	25
Cellit Fast Red B—(IG)	100
Cellit Fast Yellow 2GN—(IG)	100
Duranol Red 2B—(BD)	172
Ionamine Blue B—(BD)	85
Setacyl Direct Blue G Powder—(G)	440
Setacyl Direct Orange 2R Powder—(G)	221
Setyl Direct Red B Powder—(G)	221
Rapid Fast Dyes	
Rapid Fast Red B Paste—(IG)	550
Rapid Fast Red GL Paste—(IG)	2,000
Rapid Fast Red GZ Paste—(IG)	500
Basic Dyes	
Brilliant Rhoduline Blue R—(IG)	500
Rhoduline Blue 6G—(IG)	100
Rhoduline Sky Blue 3G Conc.—(IG)	100
Xantho Acridine MO—(IG)	441
Sulphur Dyes	
Immedial Brown W Conc.—(IG)	500
Indo Carbon SN—(IG)	500
Kurgan Violet 3RX—(IG)	300
Pyrogene Green GK—(I)	1,102
Sulphide New Blue BLX Conc. Powder—(IG)	440
Color Lake Dyes	
Hansa Red B Powder—(IG)	50
Hansa Yellow G Powder—(IG)	2,100
Hansa Yellow GR Paste—(IG)	2,310
Helio Black—(IG)	25
Helio Bordeaux BL Paste—(IG)	4,640
Helio Bordeaux Bl Powder (s. s.)—(IG)	835
Helio Fast Pink RL Paste—(IG)	200
Helio Red RMT Extra Powder—(IG)	935
Tero Brown FG—(IG)	50
All other dyes	300

A LIST OF APPRAISEMENTS OF COAL-TAR PRODUCTS WITHIN PARS. 27 AND 28 OF THE TARIFF ACT OF 1922

The following supplemental list contains the month of entry, the name of the product within paragraphs 27 and 28, together with the designation as "C" (for competitive) and "NC" (for non-compettiive), which indicates the appraisement basis for the assessment of the ad valorem duty in paragraphs 27 and 28 of the Tariff Act of 1922.

The ad valorem rate for competitive dyes is based on the American selling price as defined in Subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in Subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

This list contains the appraisement received since the publication of the June list for the Port of New York, beginning with January, 1926.

JANUARY	
Columbia Catechine G	NC
Congo Orange R	NC
Fast Cotton Gray VL	NC
Fast Cotton Violet 4R	NC
Fur Blue Black A	C
Fur Blue Black A	NC
Fur Brown P	C
Milling Yellow O3G	C
Metachrome Violet B	NC
Milling Yellow GA	NC
Oil Green ALB in lumps	NC
Oxychrome Brilliant Blue PB	NC
Thio Indigo Black B Paste	NC
Thio Indigo Brown G Paste	NC
Thio Indigo Orange R Paste	C
Wool Blue 5B	NC
Zambesi Black D	C
FEBRUARY	
Amido Azo Benzene	C
Eriochrome Violet B	NC
Formal Fast Black G Conc	NC
Guinea Rubine 4R	C
Guinea Brown 2R	NC
Rhodamine B Conc	C
MARCH	
Anthracene Brown RD Paste	C
Anthra Red B Paste	NC
Ciba Red R Paste	NC
Cibanone Blue 3G Powder	NC
Cibanone Green B Paste	NC
Cloth Fast Yellow G	C
Columbia Catechine 3B	NC
Diphenyl Fast Bronze B	C
Eriochrome Blue S	NC
Erio Cyanine AC	C
Erioglaucine EP	NC
Hydron Scarlet 3B Paste	NC
Kiton Fast Red 4BL	NC
Kiton Pure Blue V	C
Methylene Green W	C
Phosphine 3R	NC
Polar Orange R Conc	NC
Polar Red G Conc	NC
Rhodamine B Conc	C
Setoglaucine	NC
Soledon Jade Green Paste	NC
Vat Blue 3G Paste	C
Vat Red Brown R Paste	NC
Water Blue, large lumps	C
Zambesi Black D	C
APRIL	
Blue 1900 TCD	NC
Brilliant Acridine Orange A	NC
Brilliant Chrome Blue S	NC
Chlorantine Fast Brown 3RL	C
Chromazurine DN	NC
Chromocitronine 3R	NC
Chrome Orange 2R	NC

Chrome Printing Red B	NC
Chrome Printing Red Y Powder	NC
Ciba Pink BG Powder	NC
Ciba Red 3B Paste	NC
Ciba Scarlet G Extra Paste	NC
Ciba Violet R Paste	NC
Cibanone Blue RSNL	C
Chromacetine Blue S Extra	NC
Fur Blue Black SA	NC
Indocyanine B	NC
Madder Lake Powder	C
Omega Chrome Red B Conc	C
Sandothene Blue NGCD	C
Xylene Fast Green B Conc	C
Xylene Milling B Blue BL Conc	NC

MAY

Acridine Orange DHE	NC
Aurine	C
Ciba Pink BG Paste	NC
Ciba Red 3B Powder	NC
Ciba Red R Paste	NC
Ciba Scarlet G Extra Paste	NC
Leaf Green Soloid Stain	NC
Madder Lake VN 14 Powder	C
Neolan Blue RR 35%	NC
Ponceau S	NC
Red, Soloid Stain	NC
Rhodamine G Extra	C
Victoria Blue R Base	NC
Viridine Lake Powder	C

JUNE

Ciba Red R Paste	NC
Ciba Scarlet G Extra Paste	NC
Lake Geranium 101	NC
Lake Solferino	NC
Rose Garancine Grange	NC
Viridine Lake 1026 H Powder	C

STANDARD DRY-CLEANING PRACTICE IN PREPARATION

Three expert chemists of the National Association of Dyers and Cleaners went into consultation at Washington last week to prepare standard methods for dry cleaning various kinds of fabrics, as one of the final steps in the protection of members of the association against unjust claims for damages.

The chemists will work out the details of the standard cleaning practice with the aid of valuable data compiled during the research work of the N. A. D. C. at the Bureau of Standards and elsewhere. The standards thus definitely determined will furnish the principal topic for discussion at a meeting to be held in Washington in September between the dyers and cleaners and the laundry owners on one side and the textile manufacturers and distributors on the other.

It is proposed to furnish these standards to all laboratories for testing fabrics, to manufacturers, and to better business bureaus and other organizations. These standards will serve as a means of placing responsibility when dry cleaning fails to accomplish the results a customer expects for if a standard method has been followed the responsibility cannot be placed upon the cleaner and must be traced elsewhere, whereas if a standard practice has not been followed there will be cause for just complaint against the cleaner.

I. G. HEAVILY INCREASES CAPITAL

Reports from Berlin and from Frankfort-on-Main state that the Interessen-Gemeinschaft der Farbenindustrie or German dye cartel is to increase its capital, at a meeting to be called September 1, from 646,000,000 to 1,100,000,000 marks. The reasons given for this increase are several. It is claimed on one hand that a considerable part of the extra capital is required to consummate the Koln-Rottweil amalgamation recently reported, and on the other, that the larger part of the increase will be used for the development of nitrogen lines and for coal production.

OAKLEY CHEMICAL COMPANY NOW OAKITE PRODUCTS, INC.

The Oakley Chemical Company, New York, N. Y., manufacturers of Oakite products for industrial cleaning operations, announces a reorganization, with the new name of Oakite Products, Inc., a New York State corporation with $2,000,000 capital.

While the personnel of the management and the field organization of seventy cleaning specialists, located in fifty-nine cities in this country and Canada, will remain the same, the new organization is planning to greatly enlarge the scope of its work.

Starting in 1909 with Oakite as its first product, many different compounds with a varied range of uses, and all based on Oakite and its emulsifying properties, are now manufactured.

The general offices of Oakite Products, Inc., will continue to be at 22 Thames Street, New York, N. Y., and the factory, as heretofore, at Bush Terminal, Brooklyn, N. Y.

THREE NEW INDIGOSOL COLORS

Folders distributed by the Carbic Color & Chemical Company, agents for Durand & Huguenin S. A., Basle, describe the properties of three newly issued Indigosols, Indigosol Scarlet HB, Indigosol Red HB and Indigosol AZG.

These new Indigosols are described as soluble in water and of good stability, and to be chiefly useful for calico printing, being suitable for print-on styles as well as for resist printing. As the unsteamed prints, like those of the other Indigosols, are said to be very stable, and as they may be steamed in any steaming apparatus, the new colors will be found useful for yarn and block printing, as well as for roller printing.

They are best developed by the steaming process; if the nitrite process is adopted the prints must be developed at 140 deg. Fahr. in sulphuric acid of about 3.8 tw.

The shades of the three new brands are shown on printed swatches in attractive designs in various color effects.

Technical Notes from Foreign Sources

Fast-Dyeing of Silks and Cottons

Fast-dyeings on cotton and artificial silks (cellulose acetate silk excepted) capable of being after-treated with zinc chloride, lead acetate, etc., are obtained by direct application in the presence of sodium chloride or Glauber salt of suitable substantive or non-substantive dyestuffs which have been previously treated with chromium salts, or by the application of suitable dyes in the presence of chromium salts, such as the fluoride, acetate, oxalate and formate.

Suitable colors include the chromium compounds of azo dyestuffs prepared from mixtures of 2:5 and 2:8-naphthylaminesulphonic acids and salicylic acid (yellow); from meta-aminobenzoyl-para-aminosulphosalicylic acid and 1:8-acetaminonaphthol-4:6-disulphonic acid (red); and from benzidine, ortho ortho'-dianisidine or diaminodiphenylcarbamide and salicylic acid (golden yellow or yellowish orange). The chromium compound of the triphenylmethane dye, Chromoxan Blue R, dyes blue. (French Patent No. 599,566.)

Maturation of Alkali Cellulose

The maturation of alkali cellulose is retarded or arrested by conducting the operation either in the presence of inert gases or in an atmosphere free from oxygen, or in vacuum. Alternatively the maturation may be accelerated by the employment of an atmosphere of oxygen or in one which is rich as regards this gas. (British Patent No. 250,617.)

Printing Designs on Fabrics

Fabric containing cellulose is printed with a resist, then calendered and finally treated with a parchmentizing agent, to produce pattern effects or to leave the fabric more flexible in places where it has to be folded, for example, in the manufacture of collars. The fabric may be conditioned, or mercerized prior to calendering, and any usual preparatory, dyeing or finishing process may be employed. (British Patent No. 251,102.)

Bleaching Vegetable Fibers

Vegetable fibers of any kind in a loose or worked-up state are bleached by drenching with concentrated chloride of lime bleaching liquor containing at least twenty grams of available chlorine per liter, and by removing the excess bleaching agent, preferably by squeezing or in a centrifuge, to such an extent that the bleaching material retained by the fibers is sufficient to complete the bleaching of the material.

The bleaching liquor or the material before or after drenching is heated to a temperature above 30 deg. Cent. The fibers may be subjected for a short period during the preliminary heating to a swelling treatment with very diluted acids, particularly organic acids such as 0.1 per cent acetic acid. The bleaching liquor is removed by squeezing or suction filtration, and the fibrous material is then washed and submitted to a short heat treatment at a temperature of 30 to 40 deg. Cent. (British Patent No. 251,014.)

Effect of Humidity on Fabrics

An interesting investigation has been made on the effects that are caused by humidity on fabrics, with particular reference to the control of humidity during strength tests. Thus cotton, linen, wool (ordinary and chlorinated for the production of an unshrinkable finish), silk, Celanese, and Viscose fabrics dried over phosphorous pentoxide for a period of five days contained 0.8 per cent, 1.0 per cent, 2.0 per cent, 1.1 per cent, 0.1 per cent and 2.2 per cent of moisture. These fabrics regained moisture at similar rates when exposed to a moist atmosphere, there being a tendency for the moisture content to rise with increasing rapidity as the humidity rises so that their moisture contents at 100 per cent relative humidity become very large and indefinite in amount.

At a normal humidity of 70 per cent typical samples of fabric contained six to 12.4 per cent of moisture in the order: Celanese, cotton, linen, silk, wool and viscose. The regain of moisture by viscose is similar to that of wool, and chlorination of wool does not appreciably affect its regain. The initial rates of regain of moisture by dry fabrics are very rapid. Fabrics dried over phosphorous pentoxide showed a high rate of absorption of moisture, when exposed to an atmosphere of 50 per cent relative humidity, equilibrium being obtained within one hour for cotton, three hours for Celanese and five to ten hours for wool, silk and viscose silk.

Cotton and linen showed a slight increase in bursting strength with increasing humidity, the increase for linen being over 25 per cent when wet. Under similar conditions all the other fabrics behaved similarly to one another in sustaining a large and fairly regular decrease in strength with increase in humidity. Wool, silk and Celanese fabrics are more weakened by boiling for one hour in a 1 per cent solution of sodium oleate than in a 1 per cent solution of sodium carbonate. (Journal of the Society of Chemical Industry, 1926, volume 45, pages 47 to 54T.)

Dyeing Brown Shades on Cotton Fibers

Cotton is dyed in brown shades which are fast to washing, light, alkali and chlorine by impregnation with a solution containing the products that are obtained by the condensation of formaldehyde and aniline or its homologues in acid solution, being afterward passed through

a solution of sodium hydroxide or sodium carbonate, then washed, oxidized with a dilute solution of sulphuric acid containing a dichromate or persulphate, washed and soaped. The resulting shades may also be diazotized and developed with the aid of beta-naphthol or coupled with diazo compounds.

Alternatively cotton is impregnated with a solution which contains lactic acid, the above described condensation products, sodium chlorate, sodium acetate and copper sulphate, or a vanadium salt, then oxidized for a period of six hours at a temperature of 40 deg. Cent. with the aid of a solution of a dichromate. White and colored resists may be obtained by after-printing with a reducing agent, for example, a sulphite, bisulphite, or hyposulphite, and suitable coloring matters. Brown effects are also obtained by printing cotton fabrics with a paste which contains the condensation products and gum tragacanth thickening, drying, fixing in an alkaline solution, and developing the shade by oxidation with the aid of a persulphate. Alizarine and vat coloring matters may be printed and developed simultaneously by oxidation. (French Patent No. 595,705.)

Bleaching, Dyeing and Finishing Mixed Cotton and Artificial Silk Goods

The extraordinary number of different mixtures that can be obtained from artificial silks and cotton makes it next to impossible to devise a dyeing process which will serve all cases equally well. Thus it is far better to select a certain fabric, such as a cotton shirting or piece of cloth used for underwear manufacture and containing artificial silk stripes, and to outline the exact procedure for such material.

The responsibility for a well-finished fabric is a divided one. Part of it rests with the manufacturer of the artificial silk. Then again a certain role is played by the nature of the silken design interwoven with the fabric. It is understandable that the width and the number of the stripes, for example, must be such that the fabric is not pulled and twisted. It is the duty of the weaver to see that this does not happen. There are also various other irregularities which may occur due to the faulty weaving of the fabric which impair the quality of the finished material.

The bleaching of the mixed fabric is carried out as a general rule in accordance with the same process that is used on ordinary cotton materials. However, it is understandable that special care must be taken in wetting the goods due to the presence of artificial silk fibers. In addition thereto care must be taken in the sizing process in order not to hurt the luster of the silk, for it is just the luster which contributes so much to the appearance of the mixed fabric.

The singeing must also be carried out with great care. It is best, in fact, to omit it altogether except where it is absolutely necessary. The goods, after singeing, are treated with diamalt to remove the starch, the treatment being advantageously carried out under pressure, and then the fabrics are washed and bleached. Finally they are washed again and then treated with an antichlor, washed once more and then hung up to dry.

In all the operations care must be taken that the fabric is not subjected to any undue tension. After the bleaching is completed, the fabric is rolled up in a loose roll. Then again this step may well be omitted in the case of a very sensitive fabric. Goods, which are made with silken stripes, must not be boiled, as is customary in the chlorine bleaching process, but a mixture of peroxide and soap is employed as the bleaching agent. After this treatment it is well to subject the fabric to another treatment with chlorine in the cold.

It has been found necessary in many cases after bleaching to treat with its colored artificial silken stripes with hydrosulphite in order to bring back the original shade of the dye. The most effective color to use for these stripes has been found to be a golden shade; then a sun yellow follows, and blue appears to be the shade which is at its worst under these conditions.

Little need be said about the finishing process. One point must, however, be borne in mind and that is that it does not pay to use too much starch and oil, for when this is done, it will be found that the luster of the artificial silken stripes is considerably dulled due to being covered over with this mixture. Transparent substances are best employed as the saponification media, namely, gums and certain kinds of waxes. Starch itself acts as a covering agent and it is best not used in the finishing operations on mixed fabrics of this sort.

Due to the different affinities of acetate silk and cotton for coloring matters, it is possible to obtain the finest effects by redyeing the fabric. The temperature of the dye liquor must be carefully watched, as the artificial silk is, of course, more sensitive to high temperatures than the cotton, and hence the temperature should not be permitted to go above 75 deg. Cent. It should also be mentioned that the bleaching liquor should be as neutral as possible. The same apparatus can in general be employed in the dyeing of these mixed fabrics as is commonly used in the dyeing of cotton goods. (Dyer and Calico Printer, through Der Textilchemiker und Colorist, 1926, No. 12.)

Differentiating Between Kapoc and Cotton

A method of determining the percentage of kapoc and cotton in mixed fabrics is based on the facts that cotton has little affinity for dyes of the triphenylmethane group, whereas kapoc is readily dyed, and on the other hand, that kapoc is scarcely tinted by substantive cotton colors of the benzidine group. The mixed fabric is dyed at the boil in a neutral bath with Malachite Green and then in a slightly ammoniacal bath with Oxamine Red. Comparison of shades obtained from known mixtures of kapoc and cotton enables the approximate composition of the fabric to be determined. (Bulletin Societe Chimique Belg., 1926, volume 34, pages 419-421.)

TWO ADDITIONS TO THIANTHRENES

Thianthrene Brilliant Red 3B Paste and Thianthrene Orange R Paste are two new colors recently developed and placed on the market by the Newport Chemical Works, Inc. Their properties are described in leaflets issued by the Newport Company, and the shades are exhibited on swatch bows of cotton, rayon and silk.

Thianthrene Brilliant Red B Paste is said to be distinguished by its brilliant bluish shade and its fastness to boiling soap, chlorine, rubbing, cross-dyeing and steaming. Its fastness to light is also said to be very good. It is particularly suitable for printing cotton, rayon or pure silk.

The Orange R Paste newly added to the Thinathrene series is characterized by its clear bright shade, according to the announcement, and by its ease of reduction and excellent leveling and penetrating properties. It is suitable for dyeing in closed type machines as well as open tubs. Its fastness to light and boiling soap is described as very good, its fastness to chlorine, rubbing and steaming as excellent. Good printed patterns may be produced on cottons, rayon and pure silk material.

NEW NATIONAL DIRECT COLORS

Three new direct colors have been developed by National Aniline & Chemical Company, Inc., two of them being additions to the Solantine series and the third an Erie dye. They have been put on the market under the names of National Solantine Yellow 4GL, Solantine Orange G and Erie Garnet B.

The new Solantine colors are the most recent additions to National's line of fast-to-light direct dyes. National Solantine Yellow 4GL produces a pure greenish yellow shade and will find its greatest application on cotton, rayon, and pure and tin-weighted silks, although it also possesses strong affinity for wool. It dyes level, according to the description, and may be used in combination with other direct dyes; with National Solantine Blue 4GL, it is claimed, brilliant greens of excellent fastness to light are obtained. Its adaptability for use in combination shades and its dischargeability with hydrosulphite make it very useful to the printing trade.

National Solantine Orange G yields pure orange shades said to be characterized by fastness to light, washing, perspiration, chlorine, organic acids, alkali, rubbing and hot pressing. Good solubility and inertness to metals are also claimed, making both of these Solantines suited for use in all types of machines. They are particularly adapted for the dyeing of piece-goods in the jigger.

National Erie Garnet RB, it is claimed, possesses excellent solubility and is practically unaffected by metals, thereby making it well suited for all classes of machine dyeing. It is particularly useful for half-wool, dyeing the animal fiber the same strength and but slightly yellower than the cotton. Dischargeability with hydrosulphite and fastness to washing recommend it as a ground color for textile printing.

PEERLESS ISSUES NEW BROWN

A loose-leaf insert recently distributed by the Peerless Color Company, of Plainfield, N. J., to holders of the Peerless leaflet binder describes the properties of a new addition to this manufacturer's range of direct colors, under the name of Direct Fast Brown 5R, and exhibits the shade on a swatch.

Direct Fast Brown 5R is described as an extremely interesting type of level dyeing reddish shade of brown, suitable for cotton, half-wool, half-silk, leather and rayon as a self-color or in combination. The method of dyeing is standard in all respects. It may be diazotized and developed on the fiber with beta-naphthol, resorcin, etc,, producing different brown shades.

DYNAMIT A. G. TO MERGE WITH I. G.

A proposal to amalgamate their interests for the purpose of closer co-operation, made by the German dye cartel to the Dynamit A. G. (Alfred Nobel & Co.), was accepted by the latter at a recent membership meeting, according to a report from Berlin. Professor Bosch and other dye cartel executives were elected to the board of directors of the explosives concern.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

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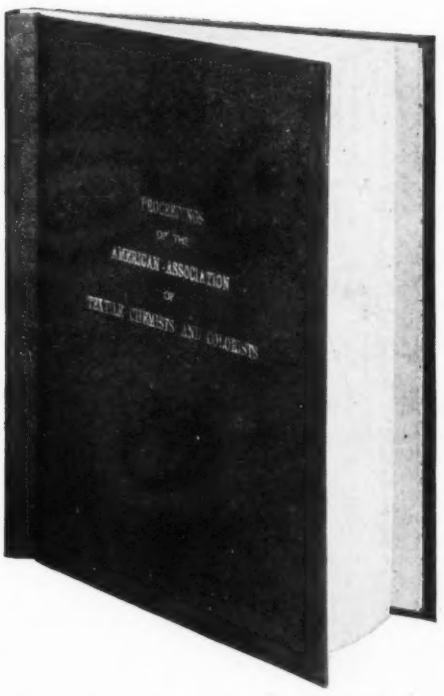

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